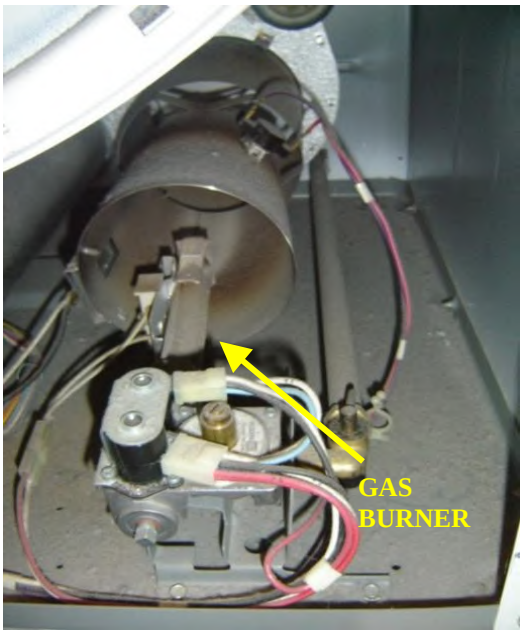
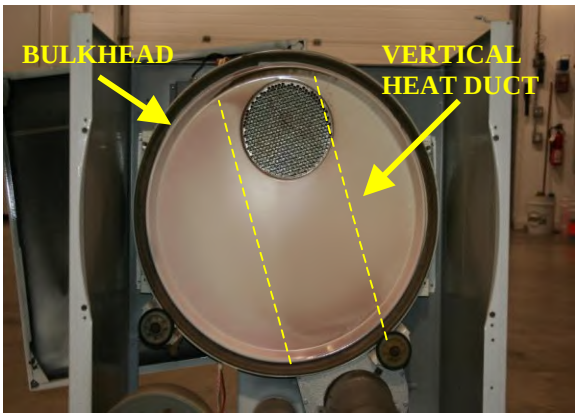
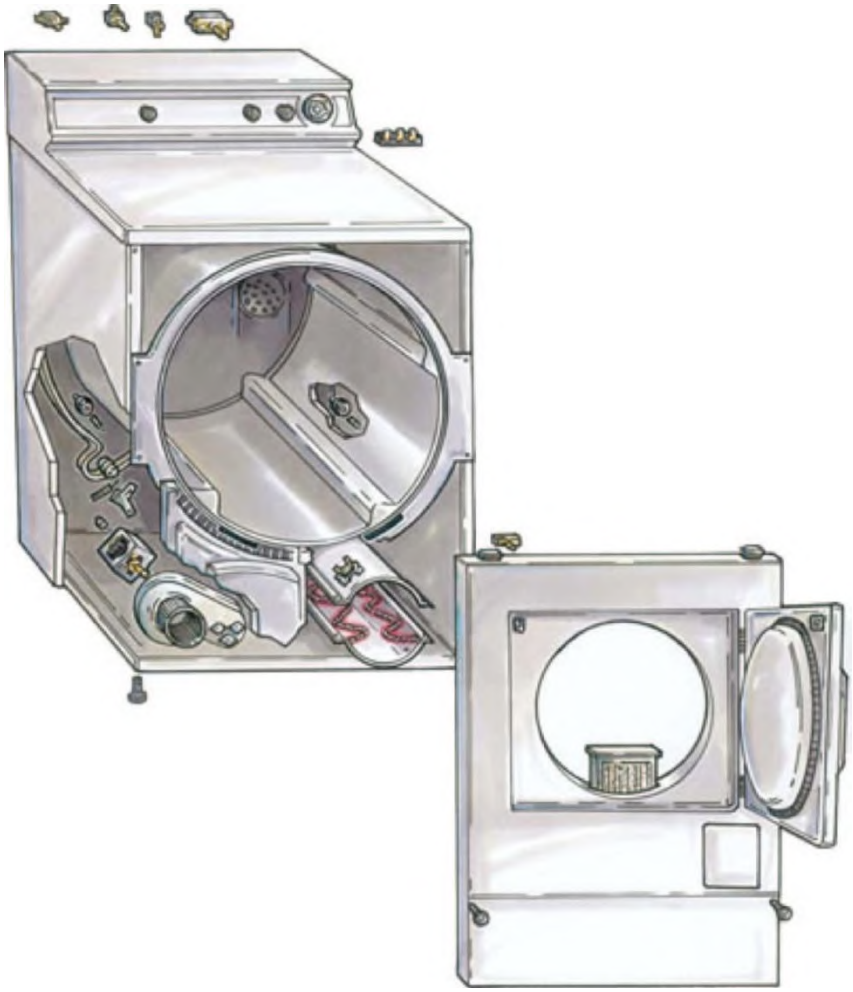
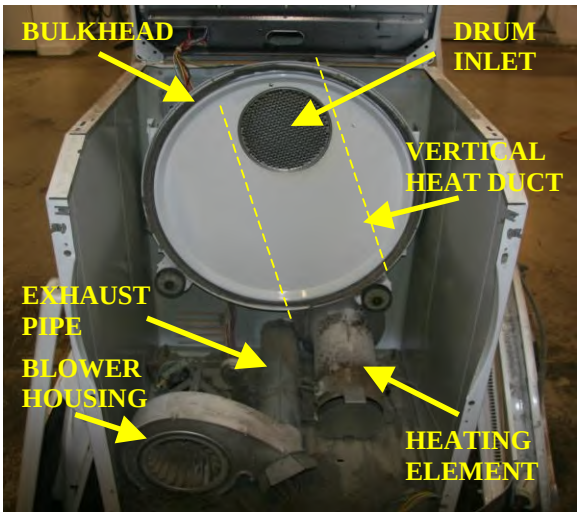
EXHIBIT “A-2”

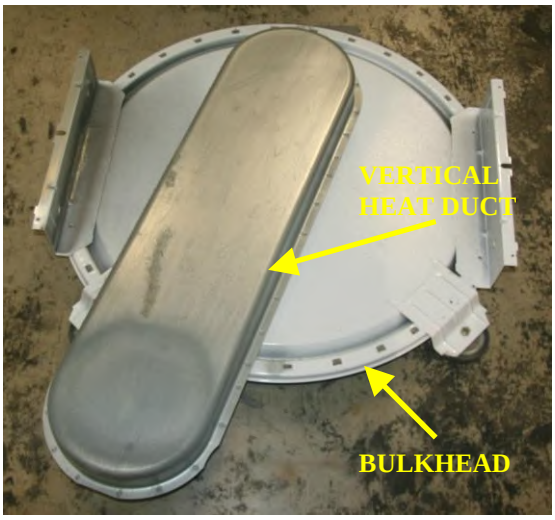




Maytag - Gas Dryer Design







Maytag - Electric Dryer Design

In the Maytag design, the main location where lint accumulates is on the exhaust side of the drum, within the trap duct that connects the lint screen/lint trap to the blower housing. There are

no ignition sources located within the trap duct. Like the Whirlpool design, the Maytag dryers do allow for minor leakage at the front and rear drum seals for lint to collect in the base of the cabinet.

And also like the Whirlpool design, the two-piece bulkhead design of the drum and duct does not form any void spaces where any significant accumulations of lint can collect behind the drum. Therefore the Maytag style of design has greatly improved fire prevention properties over the Electrolux design, in that the compartmentalization of the components do not allow lint to accumulate between the heat source and the secondary fuel loads, such as the laundry in the drum or lint collected at the lint trap.

In regards to fire hazards associated with the ignition of lint by the heat source in the base of the cabinet, lint can still enter the heater/burner assembly and become ignited. However, any ignited lint that has a small enough mass that would allow it to become airborne and be pulled horizontally through the heater/burner tube, turn a 90° corner, travel upward through the two foot length of vertical heat duct and make another 90° turn into the drum, would lose the majority of its heat energy along the way. This significantly reduces the likelihood that a lint fire caused by ignition at the heat source (gas burner flame or energized heating element) will occur in the Maytag designed dryer. In addition, there are no areas where secondary fuels (lint) can collect between the heat source and the laundry load.

In electric models, the location of the heating element within a duct in the base of the cabinet and the employment of stationary rear wall of the drum/bulkhead completely eliminate fires caused by bearing failures, as a shifting drum can never contact the heating element. The reduced number of perforations on the rear bulkhead and increased linear distance between those perforations and the heating element eliminates fires caused when foreign objects contacts the heating element.

The Maytag design of dryers used to contain a significant quantity of plastic components over a decade ago. This primarily included the lint screen and trap at the front of the drum, the trap duct that connected the lint trap to the blower housing at the lower front corner, the blower

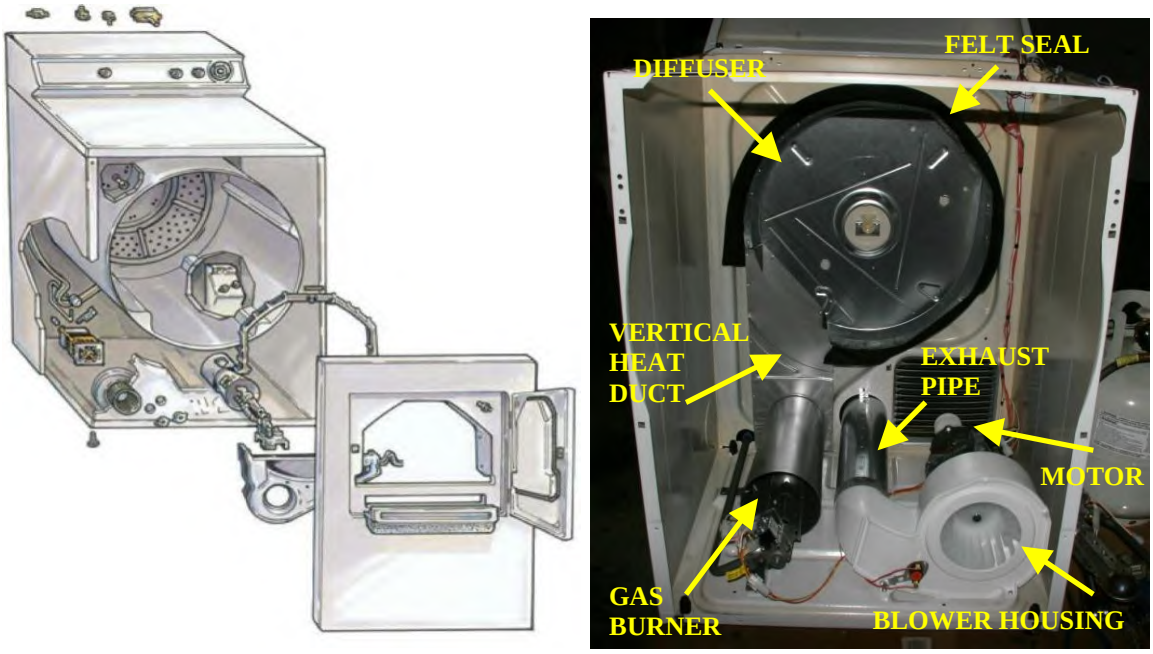
housing and the fan impeller itself. On some models the blower housing had a metal front face. Additionally, some Maytag dryers had a plastic panel on the interior of the drum door. Depending on the year and model, as well as the manufacturer specifications, the plastic components had varying HB (Horizontal Burn) or VB (Vertical Burn) fire resistive properties. There is a minimum fire resistance rating required under the Underwriters Laboratories Standard for Clothes Dryers, UL 2158. However, Whirlpool and Maytag have gone above and beyond this minimum standard in more recent model years to reduce the potential for fire growth and spread, either by using plastics with higher resistance to fire or by going back to all metal components, such as the metal trap duct found in the majority of the products. This is a clear indication that Electrolux's competitors have re-evaluated their designs and have taken the initiative to reduce the likelihood of fires in their dryers escaping should they occur for any reason.

It should be noted that Whirlpool purchased Maytag in 2006 and now all Whirlpool dryers share the same common elements of this design. In fact, this is the most prevalent design of dryers in the marketplace today. This design is not only found in Maytag and Whirlpool dryers, but also LG, Samsung and Electrolux's newest design of dryer, such as the Affinity 7.0, which will be discussed later on in detail in the Design Analysis section of this report.

Electrolux / General Electric Design

Electrolux dryers, such as the subject dryer, are similar to the original General Electric design of dryers that originated in the 1950's. This dryer uses a one-piece drum with perforations spread uniformly along the rear of the drum. The drum rotates on a single, center mounted drum pivot at the rear and drum glides at the front. Warm air is introduced through the rear of the drum via the heater housing or heater pan mounted directly behind the drum. Another indicator of this design type is the lint screen mounted at the lower front portion of the drum opening. As our research indicates, General Electric stopped manufacturing their own dryers in 1999, however, Electrolux manufactures dryers of a similar design under their own names including Frigidaire, Imperial, White-Westinghouse, Gibson, Kelvinator and Tappan and also re-branded under other brand names, such as General Electric and Sears-Kenmore.

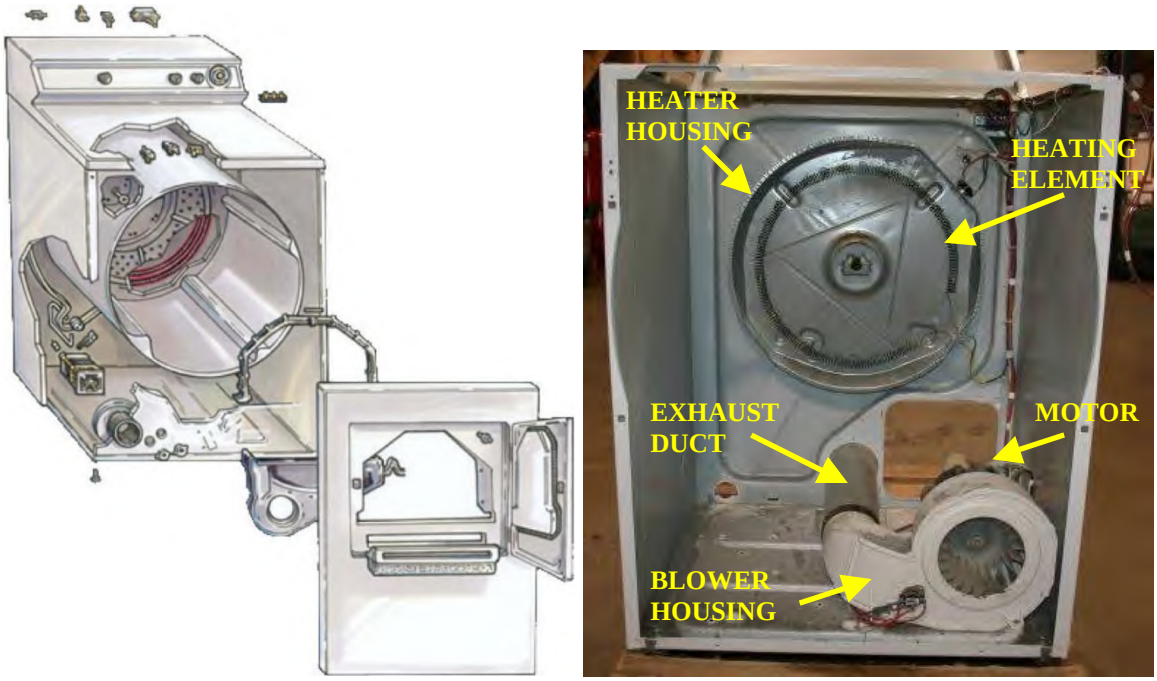
The Electrolux gas models have a gas burner assembly located in the lower left portion of the cabinet. Heated air is drawn through the burner tube and up into the shallow, circular heat diffuser behind the drum through the vertical heat duct that connects these components. The heat diffuser is approximately the same diameter as the drum and is equipped with a felt seal that creates a sealed void space between the diffuser and the rear wall of the drum. The heated air is then drawn forward into the single-piece drum, through the laundry load rotating inside of the drum, and into the lint filter assembly that houses the lint screen at the lower front portion of the front drum opening. The air is then drawn into the constricted area of the trap duct that connects the lint filter assembly to the blower housing. Here the airflow transitions from vacuum to positive pressure and the warm air is pushed out of the dryer through the short section of metal exhaust pipe.



Electrolux/General Electric - Gas Dryer Design

The Electrolux electric models have a resistive coil-heating element located in the circular heater housing attached to the rear wall of the cabinet. The heater housing is approximately the same diameter as the drum. Ambient temperature air is drawn radially through the gap between the edges of the heater housing and the rear of the drum. There is no felt seal such as the one on the

gas Electrolux dryers that seals the gap between the drum and heater housing, as it necessary to pull air into the heater pan equally around its circumference. Just as in the gas model, the heated air is then drawn forward into the single-piece drum, through the clothing load rotating in this drum and into the lint filter assembly housing the lint screen at the lower front portion of the front drum opening. The air is then drawn into the constricted area of the trap duct that connects the lint filter assembly to the blower housing. Here the airflow transitions from vacuum to positive pressure and the warm air is pushed out of the dryer through the short section of metal exhaust pipe.



Electrolux/General Electric - Electric Dryer Design

As discussed above in the section entitled **Accumulation and Ignition of Lint In the Electrolux Dryer**, the heat diffuser and rotating rear drum wall of the Electrolux design promotes the accumulation of lint behind the drum, and particularly in the heat diffuser or heater housing, where it collects at or near the heat source. The perforations across the entire rear wall of the drum allow for lint to enter this area that it essentially a hidden void space that cannot be seen by the user to evaluate the hazards associated with the collection of lint in relation to the position of the heat source. In electric models, the heating element is located directly behind the rear wall of the drum and its attached baffle, areas where lint has been observed to collect in

substantial quantities. In gas models, although the burner assembly is located in the base of the cabinet, the lint accumulates on the horizontal surface of the heat diffuser immediately adjacent to the opening at the top of short length of vertical heat duct. The lint that collects here remains constantly exposed to the burner flame and the heated air carried upward from the burner assembly. If the lint becomes dislodged it can drop into the vertical heat duct and can be directly ignited by the burner flame. If it encroaches over the vertical heat duct, the heated air itself can be sufficient to ignite the lint under certain conditions. Under certain conditions, an abnormally behaving flame can also extend upward into the heater pan and ignite the lint collected there.

Evaluation of Lint Accumulation: Ball-Hitch vs. Bulkhead Designs

The Wright Group has examined numerous dryers of other alternative designs by other manufacturers as well as the Electrolux Ball-Hitch design. It is not being contended that the alternative design of dryers accumulate less lint in the cabinet, but rather that the lint that does specifically accumulate behind the drum near the heat source, where it is most likely to be ignited by the gas burner or heating element. Attached are demonstrative photos showing the interior of Whirlpool and Maytag clothes dryer that employ the Bulkhead design. It should be noted in these photographs that, while lint can accumulate inside the any dryer cabinet, in the Bulkhead design it does not accumulate in the same position in areas where the lint is at risk of contacting the heat source. Also, the alternative Bulkheads designs do not have a void space behind the drum like those found in the subject Electrolux design, where lint has been shown to collect. Please refer to earlier sections of our report for views of the exemplar Electrolux dryers for comparison to these other manufacturers' designs.











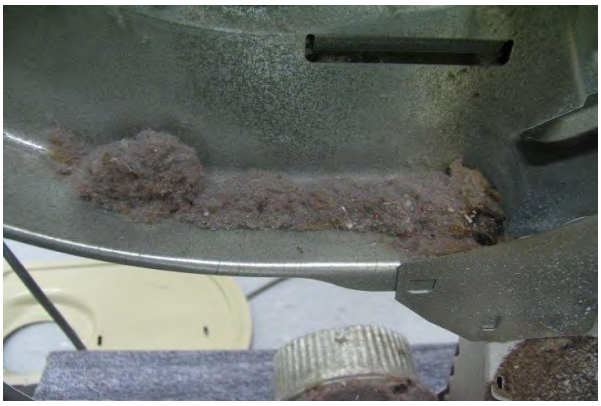




Photos of Whirlpool & Maytag Exemplars

Also included for comparison are photographs of the Ball-Hitch design employed by GE, CAMCO and MABE, which share many features with the subject Electrolux dryer design. It should be noted in this substantially similar design, quantities of lint are regularly observed in the same area to the rear of the drum and in proximity to the heat source. These areas include the rear of the drum, the interior of the heat shield/baffle that attaches to the rear of the drum and in proximity to the vertical heat duct in the gas dryers and in proximity to the heating element in the heater pan of the electric dryers.







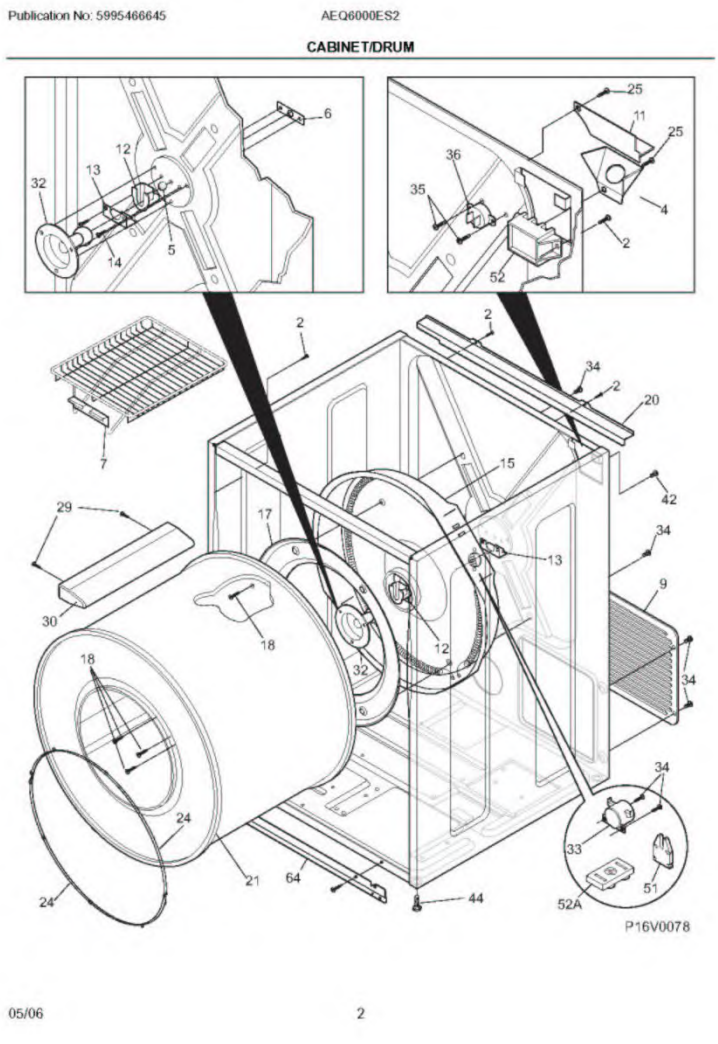



Photos of GE Exemplars with Lint

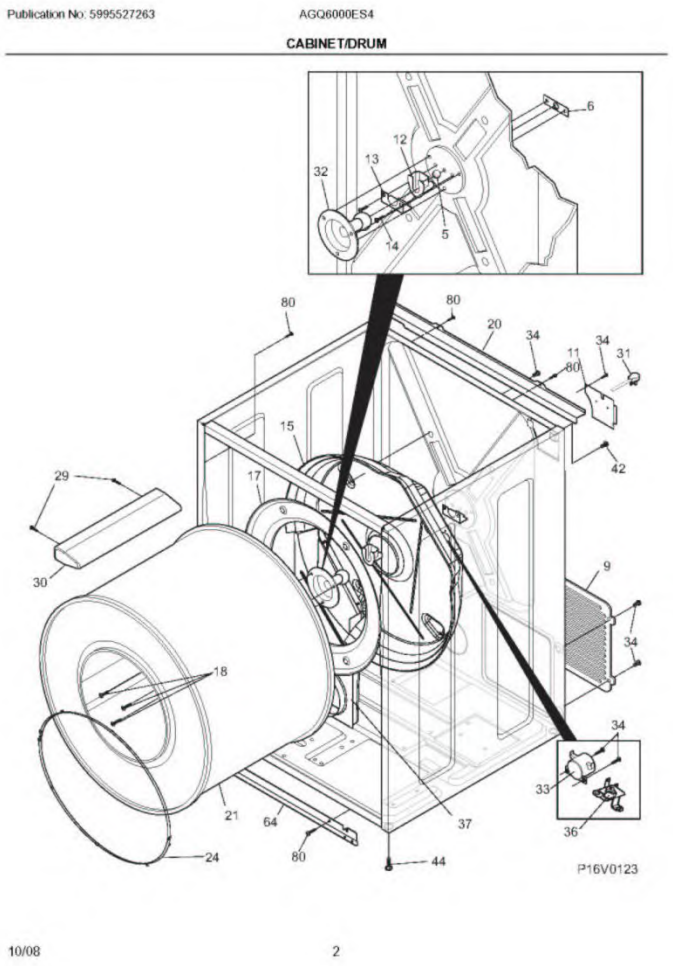
Comparison of the various designs of dryers revealed that the Electrolux/GE Ball-Hitch design types of dryers accumulated substantially more lint in critical areas where it is more probable that a fire will originate than in the alternative designs used by Whirlpool and Maytag Bulkhead designs. This lint accumulation was particularly noticeable in areas at or near the heat sources, such as behind the drum of the Electrolux/GE dryers.

New Design Incorporated by Electrolux: Frigidaire Affinity 7.0

During our recent years of analysis, we have continued to evaluate the dryers manufactured by Electrolux and released into the retail market. With the popularity of front loading washing machines, Electrolux altered their standard design for certain models of dryers to include a modified front panel and updated controls that match the fit and finish of their newer front loading Affinity washing machines. These dryers initially employed the same major internal components as observed in the subject dryer, such as the one-piece drum with perforations along the entire rear wall, heater pan behind the drum on the rear wall, etc. Examples of The Frigidaire Affinity 5.7/5.8 Cu. Ft. series parts diagrams are shown below:



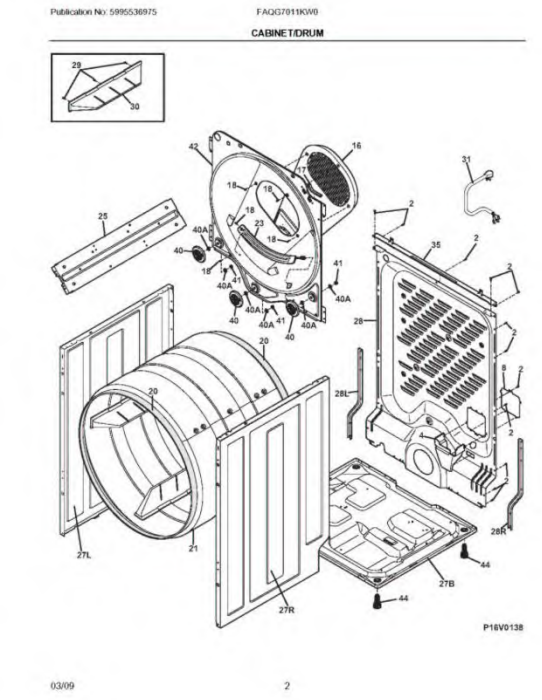
Frigidaire Affinity 5.7/5.8 Cu. Ft. Electric Dryer

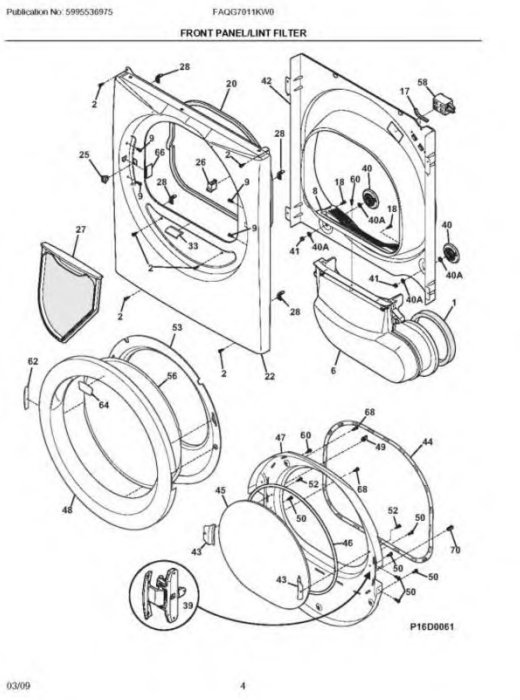


Frigidaire Affinity 5.7/5.8 Cu. Ft. Gas Dryer

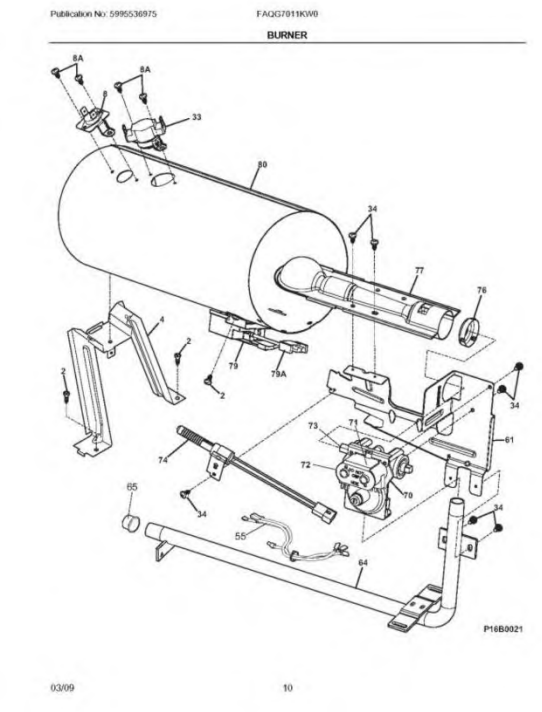
Electrolux, in 2008, introduced a new design type for its Frigidaire Affinity models, which is manufactured in Juarez, Mexico. This bulkhead design is essentially a copy of the Maytag design type outlined in the previous comparison of design types earlier in this report. As of 2011, this design has replaced the ball-hitch design of dryer completely. Electrolux has shut down their Webster City, Iowa plant where the ball-hitch dryers were manufactured. The front panel is of a similar design to the 5.7/5.8 Cu. Ft. models above and matches the front-loading washing machines. The internal components have been almost entirely changed, with the only major components retained being the blower housing, fan impeller and motor assembly. The drum has been completely changed to the two-piece bulkhead design with a stationary rear wall, with a reduced number of perforations. There is a single stationary duct that carries heated air

from the gas burner assembly or heating element, which are both located in the lower left portion of the cabinet. The Frigidaire Affinity 7.0 Cu. Ft. series parts diagrams are shown below:

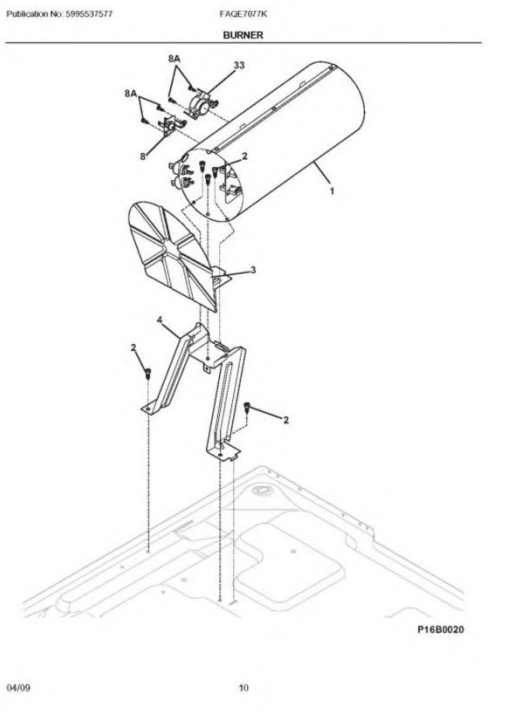




Affinity 7.0 Cu. Ft. Cabinet, Drum, Bearings Front & Rear Panel



Affinity 7.0 Cu. Ft. Gas Burner



Affinity 7.0 Cu. Ft. Heating Element

Below are photos of the new design, in a Frigidaire Affinity 7.0 Cu. Ft. Electric Dryer. The only difference in the gas model is that the heating element is replaced with a gas burner assembly.







Frigidaire Affinity 7.0 Cu. Ft. Electric Dryer

It is the opinion of the Wright Group that the dryers manufactured by Electrolux using the 7.0 Cu. Ft. dryer design (Bulkhead) are significantly safer in relation to property loss, personal injury and death than their previous dryer design (Ball Hitch) was. This new design does not promote the build-up of lint in close proximity to the heat source. This design uses the same concept as the Maytag design, a proven design used by the majority of manufactures in today's dryer market. The phasing out of the old design is noteworthy, but does not eliminate the risk of fire hazard in the millions of Electrolux dryers (Ball Hitch) of the 5.7/5.8 Cu. Ft. designs in circulation today. The subject dryer was the old design (Ball Hitch) that allows lint to collect at or near the heat source and is a fire hazard.

Evaluation of the Fire Risk Associated with the Subject Electrolux Design of Dryer

The subject dryer designs employed by Electrolux in their 5.7/5.8 Cu. Ft. dryers were evaluated and the following hazards related to the risk of fire were identified:

1. **Ignition of lint by the heat source in gas or electric models:** As discussed at length in the examination of exemplar dryer section, lint accumulation within the cabinet in areas not viewable or accessible to the end user is well documented. The actual design incorporated by Electrolux has been observed to collect a higher volume of lint at the heat source than the alternative designs such as the Maytag and Whirlpool dryers. The most dangerous collection areas where lint accumulates are those areas that are proximate to the heat source. This lint becomes the first ignited fuel and can spread fire to other

combustibles within the dryer including the plastic components of the trap duct/blower housing, and the clothing load.

In the case of gas dryers, this area is the sealed void space formed between the heat diffuser pan on the rear of the cabinet and the back of the drum. The lint that accumulates in this area has been recorded to be up to several inches deep, and can encroach upon the vertical heat duct that carries heated air from the burner to this void space. The lint can be ignited in three ways. The first is ignition from the hot gases produced by the combustion process within the burner assembly. The second is direct ignition by the burner flame when lint falls into the vertical heat duct and/or burner tube. The third is that lint accumulation on the air intake for the burner assembly alters the air-to-fuel ratio resulting in a taller flame being produced by the burner that extends up into the lower section of the heat diffuser via the vertical heat duct directly igniting lint collected within the heat diffuser pan.

In the case of electric dryers, there are two areas where dangerous accumulations of lint are typically found. The first is where lint accumulates on the rear face of the drum where the ventilation perforations form a rough irregular surface for lint to collect and inside of the heat shield attached to the rear of the drum. The second is within the heater housing or behind the housing; around the bearing/hitch assembly at the center of the heater housing or on the horizontal lip at the 6 o'clock position. Lint that accumulates in any of these areas can detach during the operation of the dryer and become ignited when it contacts the energized heating element. Once the burning lint is pulled into the rear of the drum and heat shield, the lint that collects there can ignite, spreading fire to the clothing or to the lint filter/trap duct/blower housing assembly where a heavy accumulation of lint is typically observed.

2. **Failure of the Drum Bearing Assembly:** This fire hazard is limited to electric models only. The rear of the drum is supported by a single point bearing assembly consisting of a metal ball pivot affixed to the center of the drum which rotates in the hitch assembly, consisting of a plastic or nylon bearing material supported by a metal bracket, affixed to

the rear of the cabinet at the center of the heater housing/diffuser assembly. If the plastic bearing material fails, the metal pivot rotates directly against the metal bracket of the ball/hitch resulting in scoring of the pivot shaft. Over a period of time, the scoring weakens the pivot until it is severed or breaks, allowing the drum to shift. The rear of the metal drum and/or attached heat shield is normally located less than one inch from the heating element, but under these circumstances the shifted drum can contact the heating element. If the heating element is energized, a ground fault occurs between the heating element and rear metal drum and/or baffle. The heating element typically breaks and a section of the heating element in the form of molten metal slag is released. Since the dryer is operating at the time, the airflow is being pulled into the rear of the drum, drawing this hot slag into any lint collected at the rear of the drum and/or into the clothing load, resulting in a potential fire. In addition, the shift in the drum will allow for lint that collects within the baffle/heat shield and on the rear of the drum to migrate closer to the heating element or even come into direct contact with the heating element and be ignited.

3. **Heating Element Ground Fault by Foreign Object:** This fire hazard is limited to electric models only. In the subject design of the electric dryers, metal objects such as bobby pins, bra under wires or similar items can be accidentally introduced along with the clothes load and can work their way through one of the ventilation openings on the rear wall of the drum and enter the heater housing. If these objects contact the energized heating element a ground fault can occur. Similar to the inception of fire in the bearing failure scenario, the hot molten slag produced by the arcing event can ignite the combustible lint at the rear of the drum or the clothing load itself.

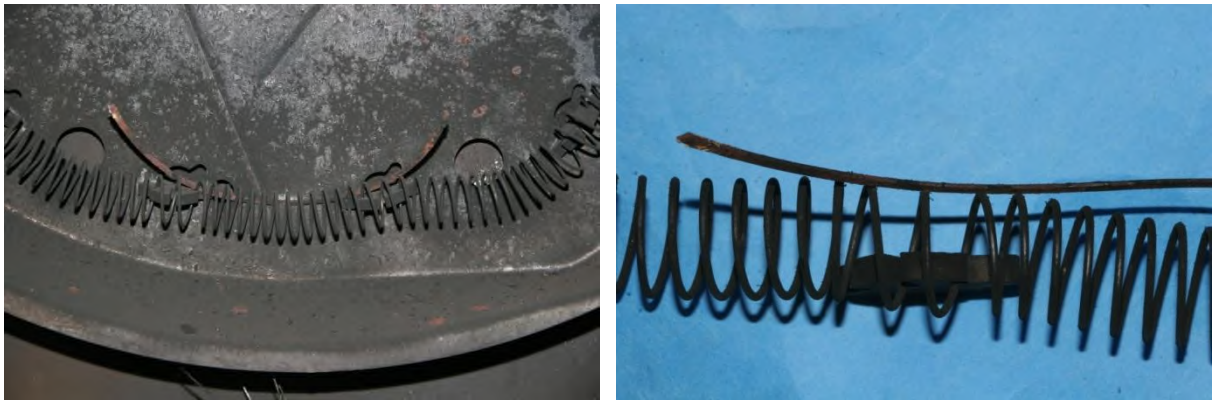
Further Discussion on Causes Related To Electric Dryers

The location of the heating element behind the drum in Electrolux Electric dryers causes additional fire safety concerns. Exemplar dryers examined by The Wright Group have resulted in the documentation of two separate ignition scenarios unique to electric dryers of this design type.

The first is a bearing failure that results in fire when the single rear bearing assembly that suspends the drum from the center of the heater housing fails, causing the rear of the metal drum and its clothing load to shift from its original position. When this occurs while the dryer is operating, the metal baffle/heat shield attached to the rear of drum contacts the energized heating element located approximately one inch from the rear of the drum, which results in a ground fault. This electrical short emits hot molten metal into the cabinet in the area at the rear of the drum. Any lint accumulated on the rear of the drum or within the cabinet can be ignited. The hot molten metal can also pass through the perforated ventilation openings in the rear of the drum and ignite the clothing load, particularly if the load is dry. The ability for the molten metal to be drawn into the rear of the drum is compounded by the negative pressure caused by the operating blower fan assembly, pulling air from the direction of the heating element behind the drum, into the clothing and toward the lint filter assembly at the front of the drum. It should be noted that other electric dryers of the other manufacturers' design types do not have their heating element located in this same location. Instead they are located in a metal duct in the cabinet below the drum. This eliminates the possibility of a bearing failure of any caliber to allow the drum to contact the heating element under any circumstances.

Example of Damage Related to a Bearing Failure

The second fire cause scenario also relates to the heating element location directly behind the drum. Metallic objects from the clothing load can pass through the numerous ventilation perforations in the rear of the drum and enter the heater housing. If any of the items should contact the heating element while the heating element is energized, an electrical short can occur. The ground fault of the object between the heating element and any grounded metal component of the dryer, such as the heater housing or rear of the drum, would also result in the release of hot molten metal lint accumulated within the cabinet or into the air stream pulling the air from behind the drum into the lint accumulated at the rear of the drum or clothing in the interior of the drum. Ignition of lint and other combustibles can also occur when the foreign object forms a high resistance connection at the heating element. Items associated with this fire cause includes any clothes that contain metal objects, in particular under wire bras, or any small foreign objects accidentally left in the pockets of clothing, such a bobby pins.



Example of Foreign Objects Contacting the Heating Element

Fire Containment Issues Related To Combustible Components

The dryers manufactured by Electrolux are all equipped with plastic trap duct/blower housing assemblies. These plastic components contribute significantly to the inherent fuel load within the dryer and provide a secondary fuel to any lint that is ignited within this restrictive assembly. In addition, the plastic trap duct/blower housing does not assist in containing the fires that propagate from the ignition of the collected lint within this component. Furthermore, once ignited, these plastic components will catch fire and melt. This allows them to flow out of the metal enclosure of the dryer and pool outside, assisting in fire spread to nearby combustibles outside of the dryer.

The exemplar dryers analyzed indicate that the door gasket used to seal the door in the front of the dryer opening fails when it is subject to fire. The gasket melts and burns away and allows fire to escape from the drum after the clothes load is ignited.

The door latch assembly on the unburned and burned dryers indicates that the latch pin is manufactured out of steel and mechanically fastened to the door assembly. The latch pin catch, which is located in the front of the cabinet, has the majority of its components manufactured out of plastic. When attacked by fire, this plastic melts and burns away. The result of the decomposition of the door latch base allows the latch mechanism to be ineffective at keeping the dryer door closed. This results in the dryer door being able to open during the fire event. When the dryer door opens, the fire escapes out of the dryer drum location.

In viewing numerous dryers involved in fires, we have observed many instances where the fire has been contained primarily to the drum and we have also inspected dryers where the fire has escaped out of the drum due to the failed gasket and door latch assembly. The lint at the rear of the dryer heater housing or diffuser has caught on fire and the fire has traveled through the rear of the drum and ignited clothes. In some instances, the fire was partially contained to the dryer assembly and other instances the fire was able to escape the dryer assembly through the front panel's door opening and the penetrations in the top of the cabinet at the control console

location. Fire also escaped the cabinet and spreads to nearby combustibles as the plastic trap duct and blower housing catch fire, causing the melted and burning plastic to flow from the cabinet to the exterior where this burning plastic can ignite other materials adjacent to the dryer.

It is the opinion of the Wright Group that all internal component materials would be improved by manufacturing them from materials other than plastic, when possible. This would assist in fire containment and not add additional spread fuels. The UL 2158 standard does allow for manufacturer's to use plastic materials that are approved under the minimum requirements of the standard. However, the standard does not account for dryers that have accumulated lint over their life. The plastic components used in Electrolux's dryers are separated from any heat sources by the location of the component parts and are rated for fire resistance per the standard. This means that the plastic components won't melt or ignite from the heat produced during the operation of the dryer under normal operating conditions. However, the addition of lint inside the cabinet adds additional first fuels that, when ignited, are in direct contact with the plastic and release sufficient heat energy to ignite said plastic components, regardless if they meet the minimum fire resistance ratings or not.

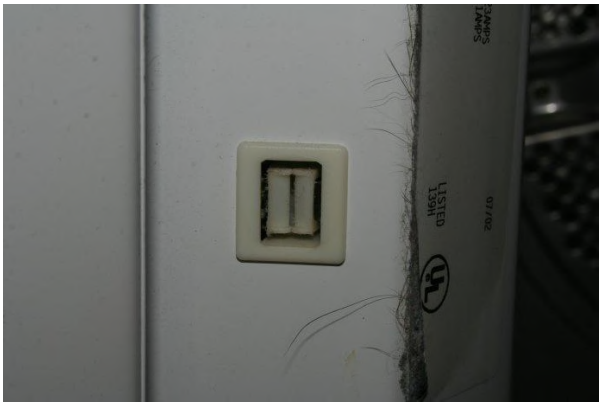
As an example, if there was a loose connection on the power cord of an electric dryer and resistance heating was to occur at that poor connection, the insulation on the wiring would char due to the inherent fire inhibitors added to the insulating materials during manufacture, but no open flame would be produced. On the other hand, if the connection area was covered in accumulated lint, the overheated connection could ignite the lint and the lint would generate open flame. The burning lint would release enough heat energy to drive off the fire inhibitors and the wire insulation would be more readily ignited than with heat alone.

The lint that collects in the dryer at or near the heat source, by nature of its defective design, allows for an easily ignitable first fuel to collect in the area of the heat source. Once ignited, the burning lint spreads to the secondary fuels within the dryer. These secondary fuels include the load, additional lint accumulated throughout other areas of the dryer's interior, and ultimately to the plastic components installed by the manufacturer.

Wright Group's Design for the Alternative Use of Materials

Using materials that would survive direct flame impingement to prevent the spread of fire from the interior of the dryer would reduce the amount of additional fuels that contribute to the growth of fire within the cabinet, assist in the prevention of fire spread from the interior of the dryer and improve the overall fire containment and spread issues associated with the Electrolux design. The following components would be better served through the use of alternate materials:

Replacing the plastic door latch with an all steel assembly



Replacing the plastic door gasket with a flameproof fibrous gasket

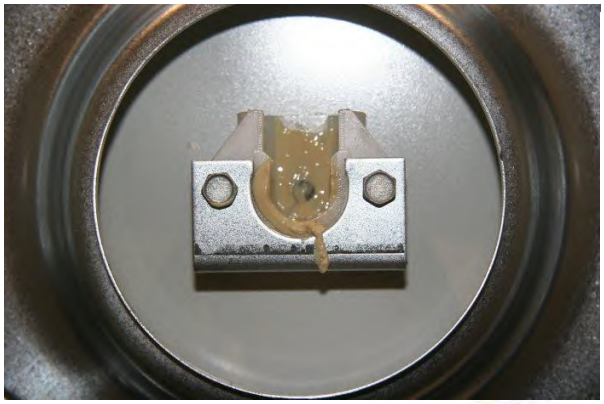
Eliminating the use of plastic end caps and related combustible components at the control console, or replacing them with steel


Replacing the plastic trap duct and blower housing with steel components




Replacing the thermoplastic fan with a thermo set plastic. Thermo set plastic is more resistant to ignition than thermoplastics, and chars when exposed to heat instead of burning and pooling.

Replacement of the plastic bearing material with steel bearing materials



Wright Group's Design Alternative for Electrolux Dryers

A complete redesign of the Electrolux dryer has been completed by Electrolux to supply dryers to the public. These new dryers use the Bulkhead design and are less prone to fires. The subject Electrolux design dryers (Ball Hitch) have been replaced with a copy of the Maytag design type (Bulkhead) that does not allow for lint to collect behind the drum near the heat source. This eliminates fires caused by the collection of lint behind the drum at the heat source, bearing failures, and drastically reduces the possibility that a fire can be caused by a foreign object contacting the heating element. We cannot speculate as to the reason, but Electrolux has already taken the initiative to begin the production of a dryer that emulates the safer design (Bulkhead) of dryer, as outlined by the Wright Group in our proposed redesign and used by the majority of manufacturers for retail production in today's appliance market, including Maytag, Whirlpool, LG and Samsung. The production of their newly designed dryer (Bulkhead) began in their Juarez, Mexico Plant in July 2008. Carl King, Electrolux's own in-house Safety Engineer, has stated that there have been no reports of any fires in their new design dryer that is based on the Bulkhead design. Subsequently, production of the subject (Ball Hitch) design of their dryers was terminated at Electrolux's Webster City, Iowa, washer/dryer manufacturing plant in March 2011.

Wright Group's Design for a Guard to Prevent Lint Ignition Fires

The most common fire cause related to Electrolux dryers is the ignition of lint by the heat source. Without re-designing the entire dryer, we have designed a remedy to eliminate the possibility of a fire being caused by the ignition of accumulated lint behind the drum. The requirement was to make this possible in a cost effective and simple manner that could be retrofitted to existing dryers in the field to improve the safety of these devices.

The Wright Group has constructed two design alternative prototypes containing a guard to separate lint behind the drum from coming into contact with the heat source. These prototypes are identified as RONCO 3 and RONCO 4. These prototypes are based on an Electrolux gas platform. The Wright Group employed principles and designs that have been in use for over 40

years. Performance evaluation of these dryers confirmed that RONCO 3 and RONCO 4 perform substantially similar to their gas and electric Electrolux counterparts. For our performance test data as it relates to RONCO 3 and RONCO 4 please see **Appendix V**. Additional testing was performed on RONCO 3 to evaluate the effectiveness of the guard in preventing lint that collects behind the drum from igniting by contacting the heat source. Under the testing, no lint was able to enter the vertical heat duct and no lint was ignited within the heater pan. For the data associated with this lint accumulation test on the RONCO 3 prototype, please see **Appendix VII**.

The basic concept actually simplifies production by using the continuity of parts for both gas and electric models. It should be noted that many components are interchangeable between gas and electric models, such as the cabinet, control console components, drum, motor assembly, the blower housing, trap duct, lint filter, etc. The differing components include the 240 volt vs. 120 volt wiring harnesses, the heater housing/element assembly vs. burner/diffuser assembly, thermal protection devices and the heat shield/baffle assembly in some cases. The alternate design modification concept uses the bulk of the gas dryer components, the difference with the electric models being that they would use a package-style heating element in place of the gas burner and a 240 supply. This would save manufacturing costs by reducing separate tooling and assembly processes.

The potential for a fire to be caused by the ignition of lint that collects in the diffuser by the burner flame is remedied by the installation of a very simple guard manufactured out of sheet metal. The concept is to simply form a guard that lengthens the vertical heat duct from where it enters the diffuser at the 7 o'clock position and extend it up to the 1 o'clock position. Any of the lint that accumulates at the 6 o'clock position is blocked from falling into the vertical heat duct/ burner tube by the guard, even if the lint accumulates to several inches in depth. Conversely, if any lint accumulates on the gas burner assembly and changes the flame characteristics resulting in a flame that reaches up into the diffuser pan, the flame cannot contact any lint accumulated at the 6 o'clock position. The guard forms an internal duct through which the air velocity remains higher than within the larger area of the diffuser pan, so lint cannot accumulate within the duct formed by the guard. The addition of a baffle to the right side of the shield creates an air gap to

eliminate the hot surface ignition of lint at the 6 o'clock position by conductive heating through the guard.

Below are photographs of the Wright Group's alternative design for the Electrolux 5.7/5.8 Cu. Ft. gas dryers. The alternative design for the gas model has been operationally tested using a large towel load and was found to retain the same average drying time as an unmodified Electrolux gas dryer.

Wright Group's Alternative Design for 5.7/5.8 Cu. Ft. Gas Dryers

The gas dryers manufactured by Electrolux for General Electric contained a similar guard that was used as the primary basis of this design. This guard was only installed in gas GE models, not in Frigidaire models. The Wright Group improved the design by enclosing the lower half, below the drum pivot opening and adding a baffle to prevent the ignition of lint that collects in the lower half of the heat diffuser. The exemplar dryer below was a General Electric gas dryer manufactured by Electrolux in December 2003.

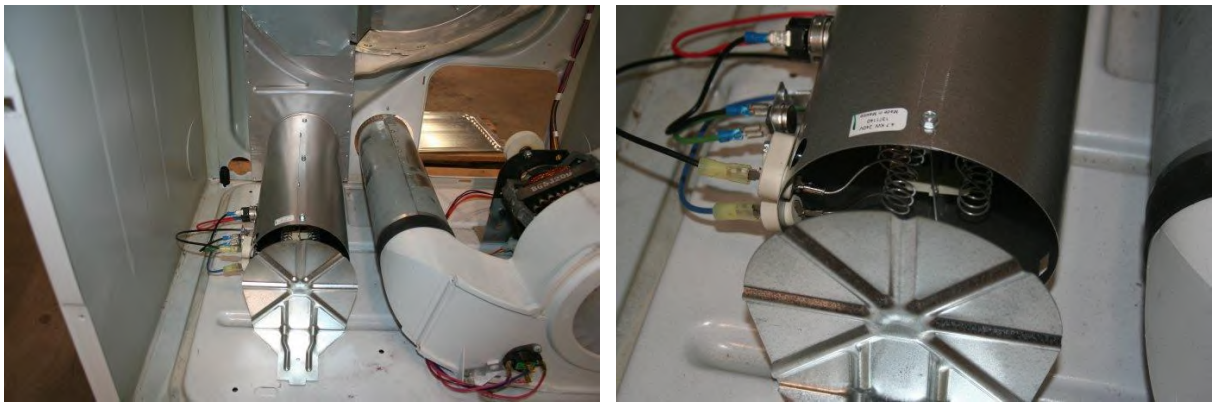
Electrolux Manufactured Guard in GE Gas Dryer Model DVL223GB5WW

The electric variation obtains additional fire safety benefits for the hazards associated with bearing failures and foreign objects. By using a linear style electric heating element located in place of the gas burner, the ring-style open heating coil behind the drum would be removed, and the alternate design would allow the package-style coil to be protected in an open ended tube in the base of the cabinet, far below the drum. This would completely eliminate fires caused by a bearing failure scenario, as the element would be protected from drum contact by the location change and the protective tube. The possibility of a fire caused by foreign object contacting the

heating element is also significantly reduced due to the increased distance and paths through which that object would have to travel. In addition, the heating element is relocated much further from the combustible lint that accumulates on the rear of the drum and clothing in the drum, so if any small piece of lint could possibly be ignited by being pulled into the heater assembly from the base of the cabinet, the burning lint is more likely to be consumed or use up its latent heat energy before it re-enters the drum to ignite the clothing or the lint downstream of the drum in the lint trap area. The final benefit of relocating the heating element to the base of the cabinet is the elimination of the need for the heat shield/baffle attached to the rear of the drum that normally collects a significant quantity of captured lint.

Below are photographs of the Wright Group's alternative design for the Electrolux 5.7/5.8 Cu. Ft. electric dryers. The alternative design for the electric model has been operationally tested using a large towel load and was found to retain the same average drying time as an unmodified Electrolux electric dryer.



Wright Group's Alternative Design for 5.7/5.8 Cu. Ft. Electric Dryers

Additional Safety Devices

The Wright Group has had the opportunity to read several reports authored by Carl King, the Product Safety Engineer for Electrolux's Laundry Division, as well as reports by their hired experts. Mr. King and Electrolux's other experts regularly opine that the fires that occur in the Electrolux dryers are either the direct result of, or significantly compounded by, the failure of the user to follow the manufacturer's instructions and/or the improper installation of the dryer and its external exhaust system. Electrolux has failed to use basic safety engineering principals to address issues such as "improper installation" or "improper maintenance" that are not only reasonably foreseeable, but that their own experts have determined as the cause of hundreds of clothes dryer fires in the Ball-Hitch dryers.

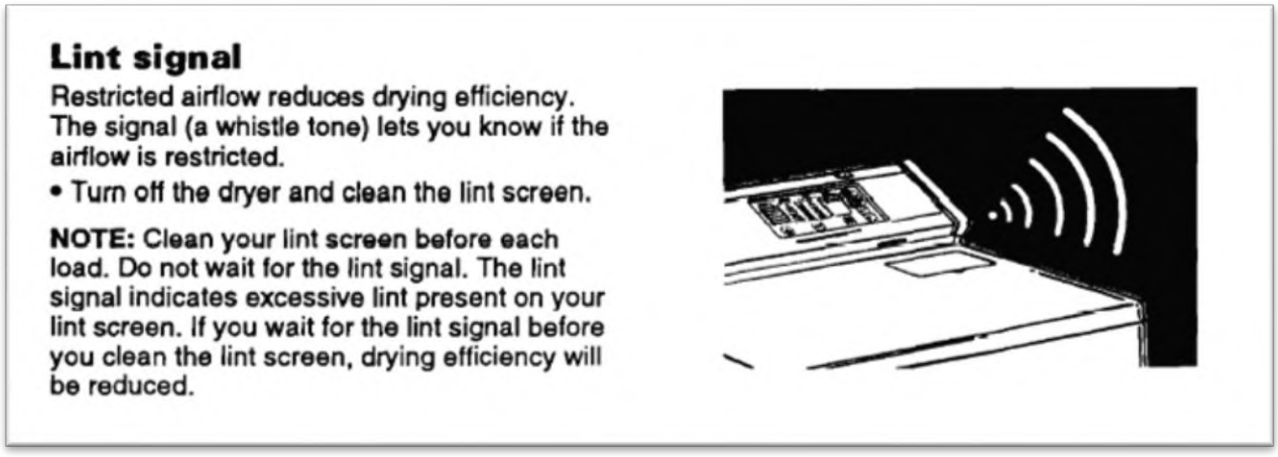
As previously described in the review of basic safety engineering principals, it is the duty of the product manufacturer to attempt to reduce or eliminate fire hazards by design. Electrolux has ignored this on the subject dryer and chose simply to passively warn about the risk of fires associated with the failure to follow manufacturer's maintenance instructions and installation instructions. In response, engineering safeguards were available to Electrolux that incorporate not only active warnings that would be more recognizable by the user, but also would force the user to service the dryers if they should reach unsafe operating conditions as alleged by the manufacturer, such as a restricted exhaust or a failure to clean the interior of the dryer. As will be discussed later in this report, the Consumer Product Safety Commission has recommended that safeguards such as these should be added to clothes dryers as far back as 1999, and in 2011,

issued a comprehensive report that supported our opinions and discussed these very types of engineering safeguards.

Exhaust Monitoring Safety Device

Electrolux contends in many cases that a restricted exhaust was a major factor that contributed to the accumulation of lint within the dryer cabinet and that a properly installed and maintained exhaust would have prevented the fire. It is foreseeable that the manufacturer's instructions as to the installation and maintenance of the external exhaust system will not be read by the user or forgotten about. By designing and installing an engineering safeguard, Electrolux could have better protect against fires that their own experts have repeatedly opined are proximately caused by external exhaust system issues.

Other manufacturers, including Whirlpool, LG and Samsung currently employ exhaust monitoring safety devices that alert the user to conditions of decreased airflow. Whirlpool added an alert system to their clothes dryers in 1994 that used an audible whistle to alert consumers that their dryer was experiencing reduced airflow.



Lint signal

Restricted airflow reduces drying efficiency. The signal (a whistle tone) lets you know if the airflow is restricted.

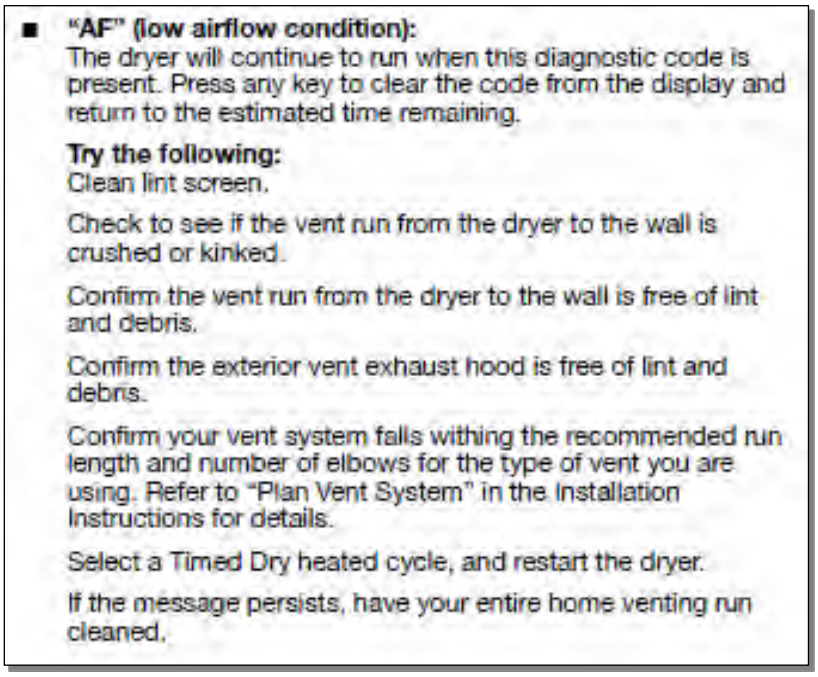
- Turn off the dryer and clean the lint screen.

NOTE: Clean your lint screen before each load. Do not wait for the lint signal. The lint signal indicates excessive lint present on your lint screen. If you wait for the lint signal before you clean the lint screen, drying efficiency will be reduced.

Whirlpool Use & Care Guide Excerpt from 1994

Whirlpool's Cabrio line of residential clothes dryers incorporates "airflow detection capabilities" which monitors the exhaust system and provides an error code on the dryer control console to actively warn users of a restricted exhaust condition. The Whirlpool Dryer Venting

Specifications (Document/Part No. W10100920B) describe the Error Code generated by the dryer and the steps required of the user to rectify the potential causes:



- **"AF" (low airflow condition):**
  The dryer will continue to run when this diagnostic code is present. Press any key to clear the code from the display and return to the estimated time remaining.

  Try the following:
  Clean lint screen.

  Check to see if the vent run from the dryer to the wall is crushed or kinked.

  Confirm the vent run from the dryer to the wall is free of lint and debris.

  Confirm the exterior vent exhaust hood is free of lint and debris.

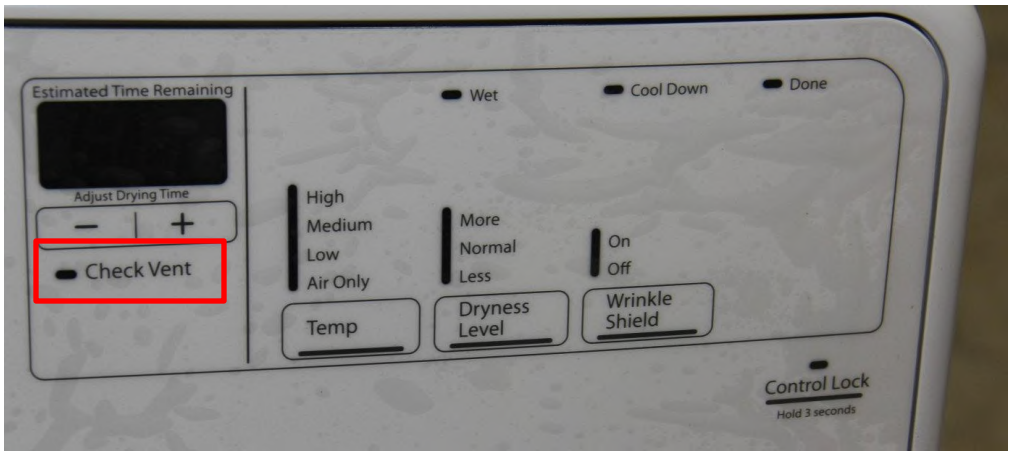
  Confirm your vent system falls withing the recommended run length and number of elbows for the type of vent you are using. Refer to "Plan Vent System" in the Installation Instructions for details.

  Select a Timed Dry heated cycle, and restart the dryer.

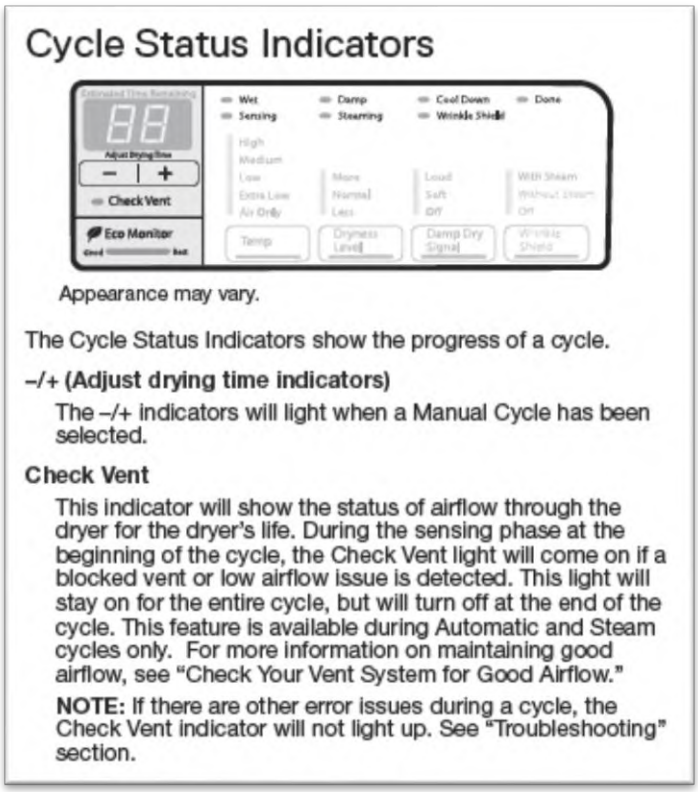
  If the message persists, have your entire home venting run cleaned.

Whirlpool Cabrio Electric Dryer Manual – Model WED6200SW

Whirlpool Duet clothes dryers also have a similar system in place, but uses an easily understood indicator light that directs the user to "Check Vent" in lieu of using an error code that relies upon a user consulting the manual for error codes. The user manual further discusses the purpose of this indicator light and how to provide corrective action.



Whirlpool Duet Vent Indicator – Model WED70HEBW0



Cycle Status Indicators

Appearance may vary.

The Cycle Status Indicators show the progress of a cycle.

–/+ (Adjust drying time indicators)

The –/+ indicators will light when a Manual Cycle has been selected.

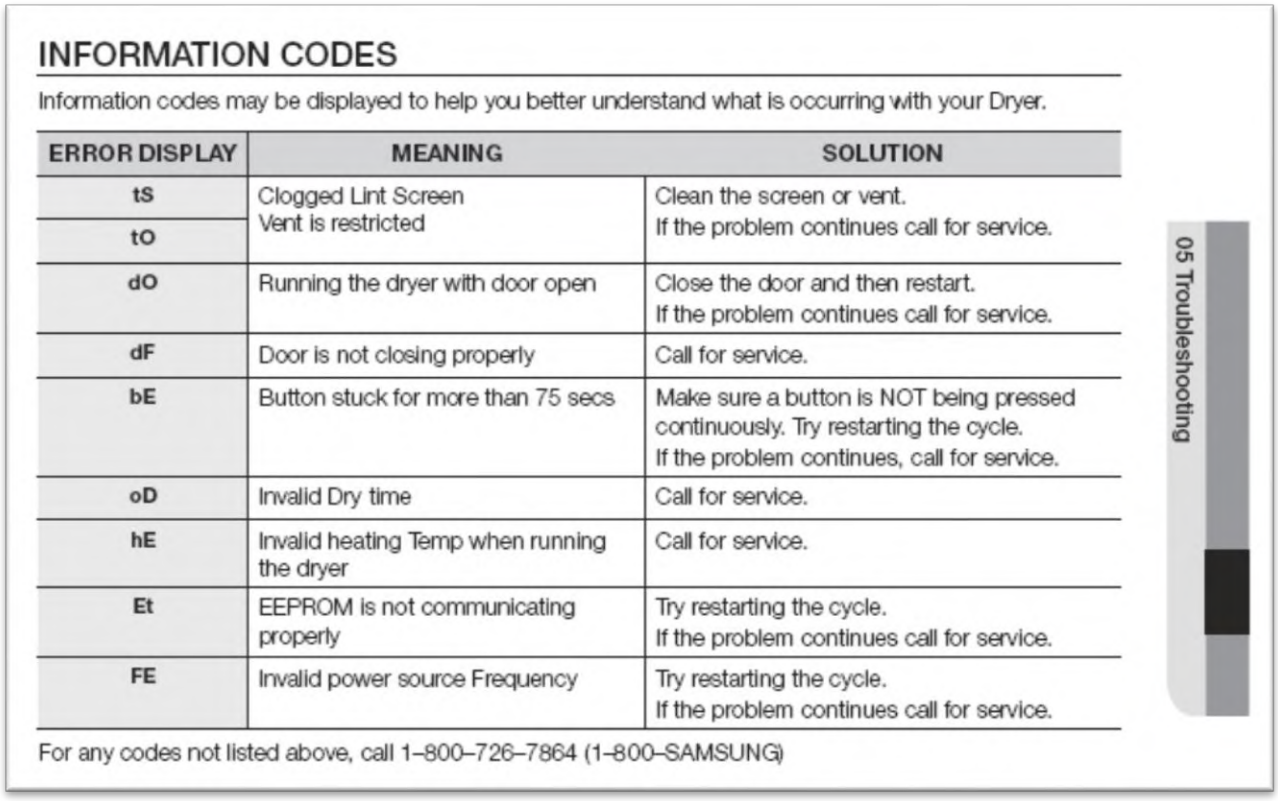
Check Vent

This indicator will show the status of airflow through the dryer for the dryer's life. During the sensing phase at the beginning of the cycle, the Check Vent light will come on if a blocked vent or low airflow issue is detected. This light will stay on for the entire cycle, but will turn off at the end of the cycle. This feature is available during Automatic and Steam cycles only. For more information on maintaining good airflow, see "Check Your Vent System for Good Airflow."

NOTE: If there are other error issues during a cycle, the Check Vent indicator will not light up. See "Troubleshooting" section.

Whirlpool Duet Manual Excerpt – Model WED70HEBW0

Samsung has also incorporated a similar design in their dryers. Samsung also uses an error code to alert users and servicers if the there is a clogged lint screen or a blocked vent system.



INFORMATION CODES

Information codes may be displayed to help you better understand what is occurring with your Dryer.

ERROR DISPLAY	MEANING	SOLUTION
tS	Clogged Lint Screen Vent is restricted	Clean the screen or vent. If the problem continues call for service.
tO		
dO	Running the dryer with door open	Close the door and then restart. If the problem continues call for service.
dF	Door is not closing properly	Call for service.
bE	Button stuck for more than 75 secs	Make sure a button is NOT being pressed continuously. Try restarting the cycle. If the problem continues, call for service.
oD	Invalid Dry time	Call for service.
hE	Invalid heating Temp when running the dryer	Call for service.
Et	EEPROM is not communicating properly	Try restarting the cycle. If the problem continues call for service.
FE	Invalid power source Frequency	Try restarting the cycle. If the problem continues call for service.

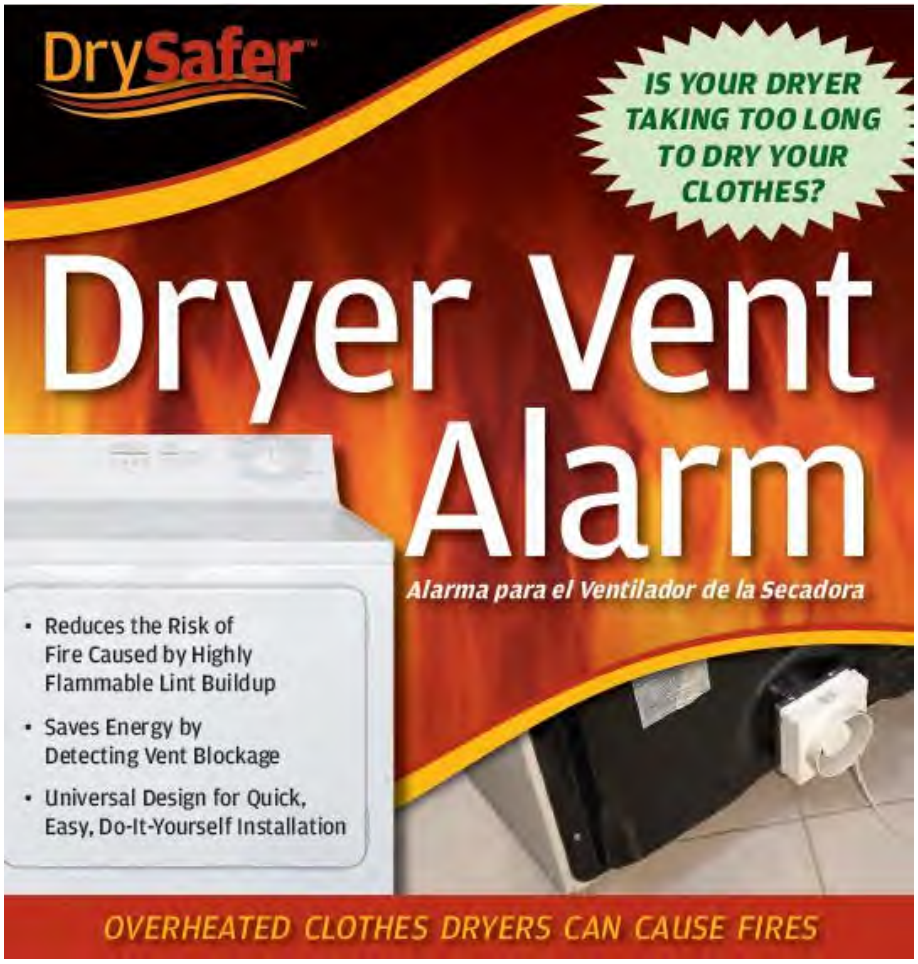
For any codes not listed above, call 1–800–726–7864 (1–800–SAMSUNG)

05 Troubleshooting

Samsung DV410-DV409-02709B Dryer Manual Excerpt

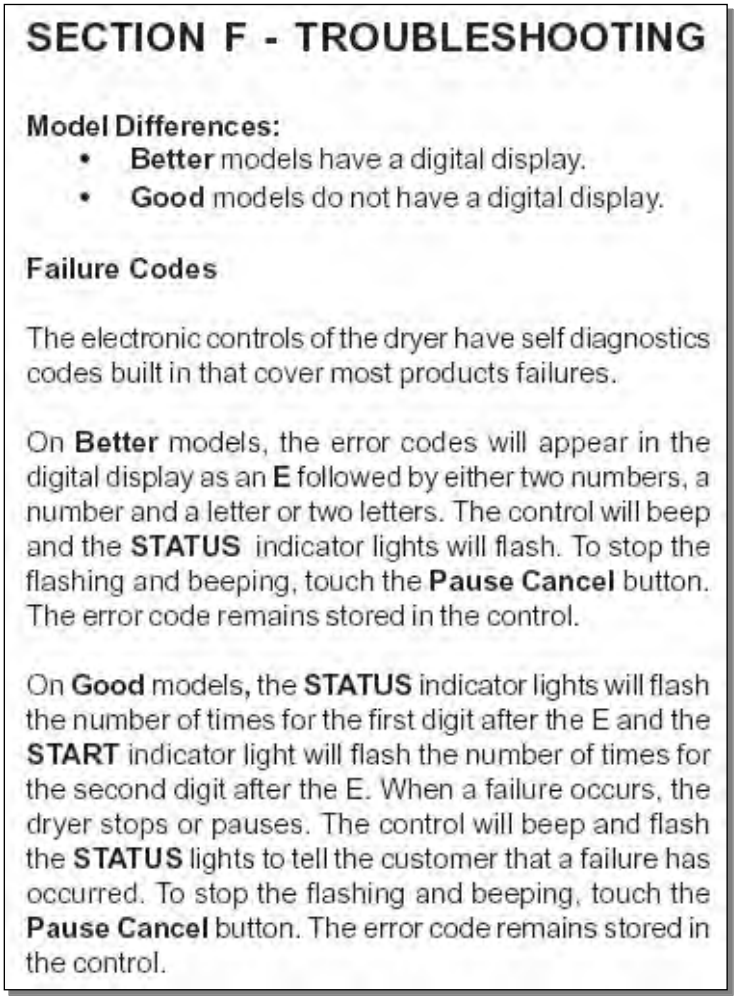
Aftermarket solutions have also been available to consumers for several years. These are secondary devices that users can install on their dryer vents to alert them of restricted exhausts. There are multiple companies that have patented these devices and sold them on the consumer market. LintAlert is the most popular device and incorporates a pressure tube that connects the dryers exhaust to the control module that plugs into the wall. It provides a set of multi-color indicator lights to let users know if their airflow is good, moderate or poor with an audible alarm if the airflow if poor. DrySafer uses a vane switch that is installed in-line with the dryer vent and also provides notification to users under conditions of reduced airflow through the exhaust.

LintAlert Aftermarket Exhaust Monitor



DrySafer Aftermarket Exhaust Monitor

Electrolux has also incorporated exhaust monitoring into their clothes dryers, but only in limited models. Since 2005 or earlier, certain models of clothes dryers Electrolux produces, both the Ball-Hitch design and the Bulkhead design, incorporate a circuit that monitors activation of the high limit safety. Should the high limit cycle repeatedly due to reduced airflow over a certain period of time, an error code is produced on the electronic display panel indicating to the user that an abnormal condition is present and the appliance needs to be serviced. This feature was only available on some dryer models with high-end features, which Electrolux described as its "Good" and "Better" models, including the dryers that had either status indicator lights or an electronic control console. Electrolux failed to incorporate this feature on the base models of clothes dryers, even though the technology was available and cost effective.



SECTION F - TROUBLESHOOTING

Model Differences:

- **Better** models have a digital display.
- **Good** models do not have a digital display.

Failure Codes

The electronic controls of the dryer have self diagnostics codes built in that cover most products failures.

On **Better** models, the error codes will appear in the digital display as an **E** followed by either two numbers, a number and a letter or two letters. The control will beep and the **STATUS** indicator lights will flash. To stop the flashing and beeping, touch the **Pause Cancel** button. The error code remains stored in the control.

On **Good** models, the **STATUS** indicator lights will flash the number of times for the first digit after the E and the **START** indicator light will flash the number of times for the second digit after the E. When a failure occurs, the dryer stops or pauses. The control will beep and flash the **STATUS** lights to tell the customer that a failure has occurred. To stop the flashing and beeping, touch the **Pause Cancel** button. The error code remains stored in the control.

Troubleshooting Excerpt from Electrolux 2005 Service Manual for 5.75 Cu. Ft. Dryer Gas & Electric Good and Better Models

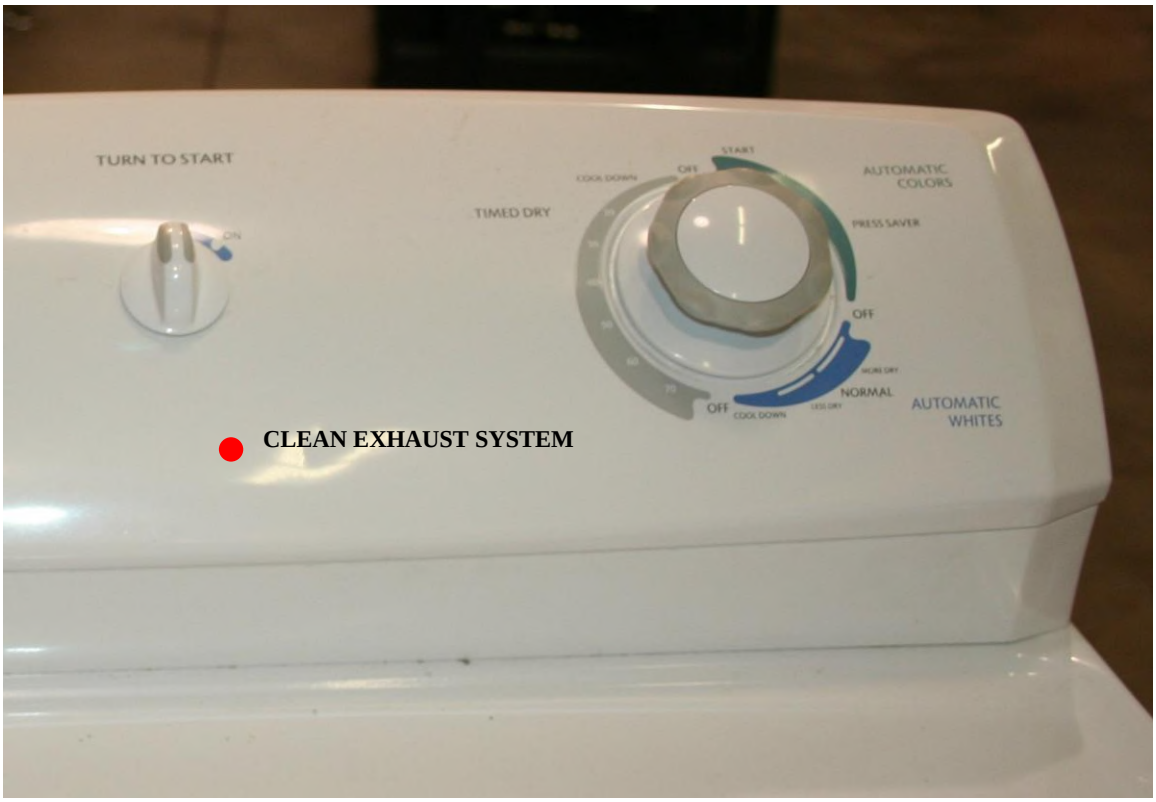
E 8C	High limit thermostat has trip to many times in a certain amount of time.	Check for blocked lint filter, blocked exhaust, air leaks around air duct, broken blower fan blades, worn or loose drum seals, dryer installed in closet with solid doors or door seal not correctly seated.

Error Code Excerpt from Electrolux 2005 Service Manual for 5.75 Cu. Ft. Dryer Gas & Electric Good and Better Models

E8C	Too many trips in a period of time.	The safety (high limit) thermostat has tripped too many times within a certain period of program time.	Check for blocked lint filter, blocked exhaust, air leaks around air duct, broken blower fan blades, worn or loose drum seals, dryer installed in closet with solid doors or door seal not correctly seated.

Error Code Excerpt from Electrolux 2009 Service Manual for 5.8 Cu. Ft. Affinity and Gallery Series Gas and Electric Clothes Dryers

The Wright Group has taken this a step further and designed a safety device that can not only be used to monitor the performance of the exhaust system attached to the dryer, but also act as a lockout should the problem not be addressed. The Wright Group design uses this same high limit monitoring system as Electrolux. The monitoring system uses a simple digital circuit to count the number of times the high limit safety activates over a given period just as used in the Electrolux dryers. Once that value is exceeded, not only does an indicator light alert the user to the problem, but also a relay is used to de-energize the heating element or gas burner, thereby removing the risk of fire, as the dryer will produce no heat. A simpler indicator light on the console instructs the user to "CHECK EXHAUST SYSTEM", as opposed to require the user to consult the manual to decipher the meaning of an error code. Further instructions placed in the manual would describe the meaning behind the indicator and the steps to clear the condition. Because this circuit is actively monitoring for condition of reduced airflow, once the exhaust restriction or other cause of reduced airflow is corrected, such as removing a blockage, normal operation will resume. This design would help reduce the accumulation of lint in dryers under circumstances where the exhaust system is deficient due to installation errors or lack of user maintenance and also force users to have their dryers serviced if they cannot rectify the situations themselves, as the dryer will not produce heat.



Indicator Light for Exhaust Monitoring System

Wright Group's Design for a Periodic Maintenance Reminder Safety:

Electrolux contends that fires that occur due to excessive lint accumulation within the cabinet could have been prevented if the user followed the recommendation to have the interior of the dryer cleaned every 18 months by an authorized servicer. Additionally Electrolux has contended that ball-hitch bearing failures should be preventable if the dryer is maintained properly. It is foreseeable that the manufacturer's instructions as to the recommended 18-month cleaning of the interior of the dryer will be ignored or misinterpreted in some cases. By designing and installing a maintenance reminder safeguard, Electrolux could have better protected against fires that they have stated are proximately caused by lack of user maintenance by forcing the user to adhere to their maintenance recommendations.

The Wright Group has designed a counter circuit, much like the oil change reminder used in the automotive industry for 20 or more years. Our counter is based upon actual time of operation and counts the amount of time the motor is running in the dryer, as any time the motor is running

there is an opportunity for lint generation. The counter circuit monitors the actual run time of the dryer and after the run time counter reaches a pre-determined hour low limit, as determined by the manufacturer, a yellow indicator light on the control console illuminates and instructs the user to "SERVICE DRYER SOON". At this point the user has been warned that the need for service is recommended, but the dryer remains operational. If the user follows the warning and contacts an authorized service person to disassemble and clean the dryer, the service person would follow the instructions in the Service Manual and reset the counter circuit back to zero. If the user were to ignore the warning, the yellow light would stay illuminated as a constant reminder. When the run time counter reaches a pre-determined hour high limit, the counter circuit illuminates a red indicator light on the control console and instructs the user to "SERVICE DRYER NOW". As an additional safety, the counter circuit opens and de-energizes the heating element or gas burner, thereby removing the risk of fire, as the dryer will produce no heat. The lack of heat will force the user to have an authorized service person respond to service the dryer and reset the counter. The placement of the reset switch in the cabinet in an area that forces the servicer to remove the drum to access and reset the switch, also providing the servicer full access to clean and inspect the interior of the machine, particularly the heater assembly and rear of the drum. There would be a need for instructions, both in the user manual and in the service manual, on the purpose of this indicator system, the maintenance steps expected by the manufacturer and the instructions on how to reset the internal switch. A warning label could also be installed at this switch location to remind whoever is servicing the dryer that the lint needs to be removed from everywhere within the dryer, including the heater pan and rear of the drum, and to clean the exhaust. Furthermore, instructions to inspect and lubricate the rear ball-hitch drum bearing would also lead to the likelihood of such a long-term component failure being identified and corrected prior to a catastrophic ball-hitch failure that could cause a fire.

As an example, Electrolux has quantified that the 18 month cleaning recommendation would be equivalent to approximately 625 cycles. This is based upon U.S. Department of Energy figures that indicate the average dryer usage is 416 times per year. Since Electrolux defines the average time of a drying cycle as one hour, then Electrolux could program the counter circuit to illuminate a yellow warning light at the 600 hour low limit and forewarn the user of the upcoming need for preventative maintenance. Further, they could then program the counter

circuit with a 625 hour high limit, which would illuminate a red warning lamp and the safeguard circuit would use a relay to deactivate the heater, preventing the dryer from heating until the dryer is disassembled and the service switch is reset. By providing specific instructions through the service manual and through the use of a warning label at the reset switch location, they would better ensure that the dryer will be periodically maintained to their own expectations by forcing the user to call for service and the servicer to disassemble the dryer.

By installing a counter circuit that monitors actual quantifiable data, such as the total hours of operation, etc., the arbitrary time factor for a maintenance requirement is removed. For example, a large family that uses the dryer 2-3 times per day may need to clean the interior of the dryer after only 12 months run worth time in order to remove the lint that is known to accumulate near the heat source and in other areas unnoticeable and inaccessible by the average user, while a single person who dries 2-3 loads per week may only require such cleaning after 36 months of time.

The Wright Group developed taken this very safeguard and implemented it in a working dryer to test its feasibility and reliability. This active warning and safety device was constructed using a simple modular circuit board with a microchip that is programmed to count the actual run time of the dryer and when the pre-set parameters are reached, conduct specific actions. In this case the counter was programmed to light a yellow indicator at 10 minutes of use and at 12 minutes of use, light a red indicator and engage a relay that deactivates the heat source. The microchip used has non-volatile memory, so it will retain the count even if the dryer is unplugged for service or storage. The reset switch was positioned on top of the dryer for ease of access during the reliability testing, whereas in a final production model it would be located within the cabinet where it would be accessed by removing the drum.

This maintenance reminder safeguard was incorporated into a dryer we refer to as RONCO 5, being the 5th clothes dryer we have implemented and tested an alternative design or safeguard within. RONCO 5 is a working Electrolux electric ball-hitch clothes dryer (Model: GLER341AS1) that was tested with wet towel loads and not one failure of the maintenance reminder safeguard occurred during the testing, indicating that it was 100% reliable. The

maintenance reminder safeguard was tested for over 50 cycles, which is the equivalent of 75 years of life if it were to be programmed as an 18 month equivalent reset counter. Furthermore, since this safeguard is electronic in nature it has a long life expectancy; the relay used to deactivate the heater is rated to a minimum service life of 100,000 cycles. A video of a testing cycle was recorded on the RONCO 5 dryer to demonstrate the functionality of the maintenance reminder safeguard.

RONCO 5 Maintenance Reminder Safeguard Testing

For real world production, a circuit board would be specifically designed for the older mechanically controlled dryer models. This would be similar to the moisture sensor control boards found in many clothes dryers from the mid 1990's onward. We estimate the cost of this maintenance reminder safeguard for the older mechanical dryers would be approximately four to five dollars per unit, based upon a million units. The electronic controlled dryers would be substantially cheaper to manufacture with this system, as the majority of the circuit components

are already in place in those units. It is inherently possible that all these electronically controlled dryers would need would be a software change.

WARNINGS & USER INSTRUCTIONS:

Dryer Warning Labels

The warning label is installed on the right side of the drum opening and is visible to the user when the door is open. The warning on the dryer does not warn against the fire hazards associated with lint collecting behind the drum at the heat source. This warning label only instructs to "exhaust the dryer to the outdoors", and to "prevent the accumulation of lint around the exhaust opening and in the surrounding area". The only other maintenance instructions regarding the exhausting of the appliance and prevention of lint accumulations within the appliance on the warning labels or visible on any of the component parts is to "Clean lint screen before or after each load." The Electrolux stand-alone dryers do not contain any warnings as to having the dryer serviced every 18 months, though their laundry centers, the combination washer/dryer unit, do have a warning label at the drum opening with those instructions. This inconsistency demonstrates Electrolux's failure to provide consistent warning as to the maintenance methods they deem important as to the prevention of fires. Both labels are included below:

Warning Labels from Standalone Dryer (Left) & Laundry Center (Right)

Dryer User's Guide

Based on industry averages, the operational life expectance of a dryer is estimated to be at least ten years and possibly as long as 20 years. In addition, Electrolux requires routine maintenance on the part of the owner/operator. In their User's Guides, Electrolux recommends a qualified

individual clean the interior of the dryer every 18 months. While there is some interpretation as to the definition of a "qualified individual", as it is not defined in the User's Guide, the user is instructed on basic maintenance such as cleaning the drum and emptying the lint filter between loads. The owner's manual also indicates that an authorized servicer must perform repairs and servicing.

Underwriters Laboratories, Inc. discusses User Maintenance Instructions under section 7.5.1 of UL 2158 Standard for Safety – Electric Clothes Dryers. It states "The User Maintenance Instructions shall include explicit instructions for all cleaning and servicing that is intended to be performed by the user, such as lubrication, adjustments, or removal of lint, dust or dirt." The labels and instructions for the Electrolux dryers do not discuss how the user should remove the dust and lint that collects behind the drum and in other inaccessible areas.

Excerpt from the Electrolux User's Guide

- The Safety Instructions found in the User's Guide reiterate the following:

  ! WARNING Clean the lint screen before and after each load. The interior of the dryer, lint screen housing and exhaust duct should be cleaned approximately every 18 months by qualified service personnel. An excessive amount of lint build-up in these areas could result in inefficient drying and possible fire. See Care and Cleaning, pages 12-13.

  ! WARNING Do not operate the dryer if the lint screen is blocked, damaged or missing. Fire hazard, overheating and damage to fabrics can occur. If your dryer has a drying rack, always replace the lint screen when finished using the drying rack.

  ! WARNING Keep the area around the exhaust opening and surrounding areas free from the accumulation of lint, dust and dirt.

> ! Failure to comply with these warnings could result in fire, explosion, serious bodily injury and/or damage to rubber or plastic parts of the dryer."

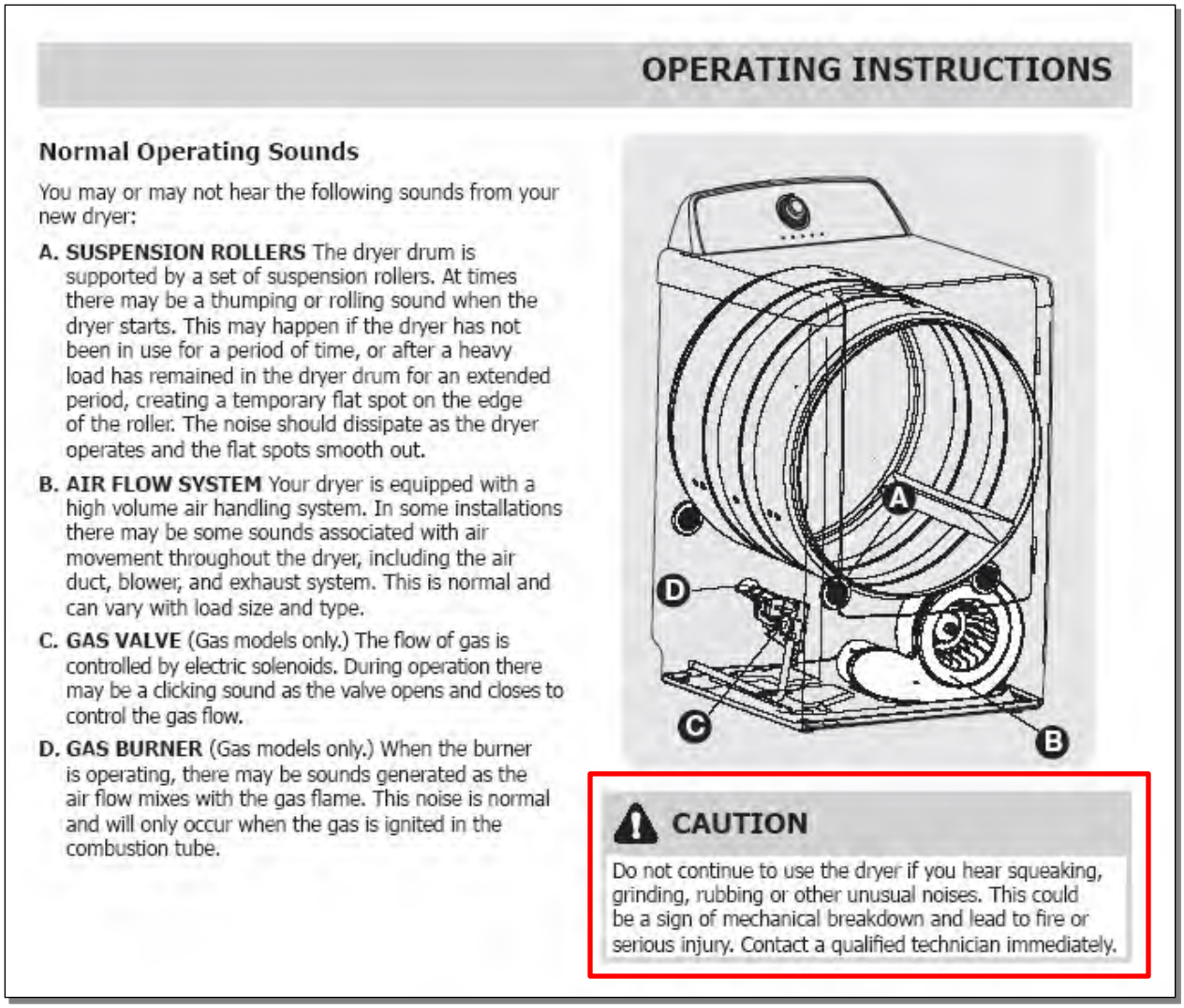
In regards to the requirement to have the dryer and its exhaust cleaned "approximately every 18-months", it is our opinion that this timeframe is based upon a numerical average time period determined by the manufacturer to be suitable for a user to have the appliance cleaned. Electrolux has not been able to tell us how they have come up with the "18 month" time period, and in Electrolux dryers manufactured for GE and "12 month" recommended cleaning timeframe is cited in the User's Guide. Due to the varying duty cycles of these appliances, as well as the variations between installations, this arbitrary timeframe is insufficient. A single user may dry one load of clothing a week, while a large family can easily dry multiple loads of clothing daily. Similarly, the amount of lint produced also correlates to the type of clothing and the textile properties of which the clothing is made. For example, a load of cotton towels produces a greater quantity of lint than a load of polyester shirts. The venting of the dryer, even if the dryer is vented according to manufacturer's instructions, will also affect the performance of the dryer, particularly the ventilation of lint particulate. A dryer that is located against an exterior wall and is vented directly to the exterior will be the most efficient, while a dryer located in the center of the building may meet the Maximum Length/Number of 90º Turns requirements set forth by the manufacturer, but will be less efficient at venting lint particulate. These factors all affect the statistical averages upon which the manufacturer based their timeframe for required cleanings.

A clothes dryer is one of the most common household appliances and the vast majority of users are familiar with the general operation of these devices, therefore it is foreseeable that the user may not read the manual. It is foreseeable that the user will continue to operate the dryer using only basic maintenance practices, such as cleaning the lint screen between loads and inspecting the exterior vent for blockages, until symptoms would arise that would indicate a need for service. The risk of fire that is tied to areas not viewable or serviceable by the average user would continue to go unnoticed by the user in the meantime. It is foreseeable that the user will not refer to the instruction manual unless they are having problems with the dryer. It is just as foreseeable that the user will not hire a service technician to work on the dryer unless they are having an operational problem with the dryer. It is foreseeable that Electrolux dryers most likely

will not be maintained according to manufacturer's instructions and that the vast majority of users will misinterpret, forget or ignore the 18 month cleaning requirement, particularly in view of the costs associated with having that period cleaning performed by a service technician.

Lack of Bearing Failure Warnings/Instructions

In cases involving fires caused by rear bearing, or "ball-hitch", assemblies, Electrolux fails to warn users. It is their unreasonable expectation that users will hear a squeaking noise that precedes a bearing failure and also their false expectation that users will immediately service their dryers if such an unusual noise is heard. This expectation is not reasonable, as there are numerous other noises that can come from a dryer that may not be an indicator of a hazardous fire condition, such as a squeak from a belt or an idler wheel. Electrolux produced ball-hitch dryers subject to this potential failure mode up until March of 2011. In the years that these dryers were made there was never any warning or instruction in the User's Guides or warning labels on the dryer to warn operators that abnormal noises could be an indicator of a potentially life-threatening fire condition. It was not until later in 2011 did they begin adding this type of warning to the manuals for their new bulkhead dryer, which does not have any fire risk for a rear drum bearing failure resulting in fire, as it was eliminated due to the design change.



OPERATING INSTRUCTIONS

Normal Operating Sounds

You may or may not hear the following sounds from your new dryer:

A. **SUSPENSION ROLLERS** The dryer drum is supported by a set of suspension rollers. At times there may be a thumping or rolling sound when the dryer starts. This may happen if the dryer has not been in use for a period of time, or after a heavy load has remained in the dryer drum for an extended period, creating a temporary flat spot on the edge of the roller. The noise should dissipate as the dryer operates and the flat spots smooth out.

B. **AIR FLOW SYSTEM** Your dryer is equipped with a high volume air handling system. In some installations there may be some sounds associated with air movement throughout the dryer, including the air duct, blower, and exhaust system. This is normal and can vary with load size and type.

C. **GAS VALVE** (Gas models only.) The flow of gas is controlled by electric solenoids. During operation there may be a clicking sound as the valve opens and closes to control the gas flow.

D. **GAS BURNER** (Gas models only.) When the burner is operating, there may be sounds generated as the air flow mixes with the gas flame. This noise is normal and will only occur when the gas is ignited in the combustion tube.

CAUTION

Do not continue to use the dryer if you hear squeaking, grinding, rubbing or other unusual noises. This could be a sign of mechanical breakdown and lead to fire or serious injury. Contact a qualified technician immediately.

Abnormal Noise Warnings from Frigidaire Affinity Electric Dryer Use and Care Guide, Model FARE4044MW, Published November 2011, Page 5

Electrolux Service Manual

Furthermore, research was conducted into documents authored by Electrolux regarding the procedure for "qualified service personnel" to disassemble and clean the interior of the dryer, lint screen housing and exhaust duct. We obtained a copy of the **Electrolux Service Manual** for **27" Dryers, Gas and Electric Models** (September, 2002). This was the only document published by Electrolux, which covered the service of the dryers constructed using the design and components similar to and including the subject dryer.

The service manual contained the following warning:

- "ATTENTION!!!"
- "This service manual is intended for use by persons having electrical and mechanical training and a level of knowledge of these subjects generally considered being acceptable in the appliance repair trade."

As outlined in the above statement, this Service Manual is not meant for the average end user. However, a review of the technical document meant for an actual service person did not reveal any information relative to the prevention of fires through routine maintenance procedures.

The service manual contained multiple sections regarding the operation, troubleshooting and disassembly of Electrolux dryers. This is a summary of the sections contained within the service manual:

1. **SAFE SERVICING PRACTICES** – Describes the safety practices to be employed when servicing any appliance
2. **QUICK REFERENCE SHEET** – Describes the nameplate and tech sheet locations and serial number breakdown
3. **SAMPLE WIRING DIAGRAMS** – Contains sample wiring diagrams for electric and gas models, with and without electronic moisture sensor controls
4. **SECTION A – OPERATING INSTRUCTIONS** – Contains a copy of the standard operating instruction sheet supplied with all Electrolux dryers
5. **SECTION B – OWNERS GUIDE** – Contains a copy of the Owners Guide supplied with all Electrolux dryers
6. **SECTION C – INSTALLATION INSTRUCTIONS GAS & ELECTRIC DRYER** – Contains a copy of the Installation Instructions supplied with all Electrolux dryers, for both gas and electric dryers
7. **SECTION D – HOW THE COMPONENTS WORK** – Contains a description of the basic components of the dryers and principals through which they are employed during the drying process
8. **SECTION E –** There is no SECTION E contained in the Service Manual, nor is there a listing for SECTION E in the Table Of Contents at the front of the manual

9. **SECTION F – TROUBLESHOOTING FLOW CHARTS** – Contains numerous flow charts to assist in the diagnosis of a problem and to apply the recommended corrective action(s)
10. **SECTION G – TEARDOWN** – Contains a step by step guide (with corresponding photos) to the complete disassembly of the dryer and its components

A review of the Service Manual revealed NO specific instructions as to the required 18-month cleaning within the Owner's Guide. There was no description of how to clean the interior of the dryer, the lint screen housing or the exhaust duct. There was no discussion as to the evaluation of the appliance for excessive lint buildup, and no specific description of the area behind the drum near the heat source, the plastic trap duct and blower assembly or any other areas that should be cleaned every 18 months. There is also no description of expected maintenance for other components that could cause of the fire, particularly for the rear bearing ball-hitch assembly, which Electrolux is aware has a useful life expectancy and can fail prematurely. If servicers were instructed that they should inspect the ball-hitch components for wear and re-lubricate the ball-hitch as part of routine maintenance then the risk of a ball-hitch failure would be reduced when compared to the complete lack of such an instruction in the present service manuals.

Research of Maintenance by Authorized Servicers

As part of a further evaluation as to the frequency of regularly scheduled maintenance of Frigidaire dryers, we attempted to obtain service quotes from local appliance service companies. We accessed the Electrolux appliance website (www.electroluxappliances.com), and using their "Service Locator" searched for recommended local service companies. We entered the zip code for our office in Uxbridge, Massachusetts, as well as the neighboring zip code for North Uxbridge, but no service providers were listed for the surrounding area. We then called the telephone number listed on the web page, which directed us to call an alternate number after working through the various option menus. Only then were we provided with recommended service companies.

We conducted a survey of three of the recommended service companies. The first was one of the largest appliance retailers in the local metropolitan area. When we spoke to their Customer Service Department to request a cleaning of a Frigidaire gas fired dryer, the operator stated that they did not normally offer that service. We further explained the requirements of the regular maintenance listed in the Electrolux User's Guide. We were then provided with basic instructions to inspect and clean the lint from the exhaust hood on the exterior of our building. Finally, after explaining that the owner's manual required that the interior of the dryer needed to be cleaned, we were then quoted a one-time cost of $109.00 for a service technician to respond to the location and diagnose the problem, and an additional $27.25 for every 15 minutes of additional labor. Contacting two other smaller appliance repair companies yielded similar findings, with questions regarding the need for service prior to rate quotes from the second company of $94.00 for the site visit and first 30 minutes of service and $20.00 for each additional 15 minutes of labor, with an estimate of 45 minutes of labor. The third company quoted a flat rate of $85.00 for the cleaning of the dryer and exhaust system. Based upon these figures, it is estimated that a user who follows the maintenance schedule would incur a cost of approximately 20-40% of the original purchase price of their appliance every 18-months.

In our prior discussion regarding the survey of the local service providers, not one of the representatives we interviewed was overly specific about the steps they would take to clean the dryer and related components. One appliance sales company stated they did not receive any specific instruction manuals or reference materials as to the time period or specific requirements regarding the 18-month cleaning schedule. Only one of them stated that they would go as far as removing the drum from the dryer and clean the area behind the drum. Accordingly, even if a user were to hire a service provider to clean their dyer as recommended by the User's Guide, it is foreseeable that the servicer may fail to remove lint from the most critical, yet not easily accessible, locations in the dryer, such as the area behind the drum where the heat source is located.

In a recent Electrolux clothes dryer fire, the Wright Group was provided a copy of the deposition of a Service Manager for Abt. Abt is large company that is an authorized Electrolux service provider with over 1500 employees. The Service Manager testified that Abt did not provide the

18-mouth service to any of its customers until the last year. Abt has no instructions from Electrolux on how to clean the interior of the cabinet and now only offers a vent cleaning service. The customers of Abt can now have their vents cleaned but Abt will not complete the cleaning of the interior dryer cabinet service. The Abt Service Manager testified that has never personally experienced a situation where a user has contacted Abt and requested the 18-month service recommended by Electrolux in their User Guide.

STANDARDS REVIEW:

American National Standard Institute, ANSI Z21.5.1/ Underwriters Laboratory, UL 2158

This writer has reviewed the ANSI Standard Z21.5.1 regarding gas clothes dryers and has noted no testing of any units that have already been in service in the users' homes or simulated aged units. They do not discuss the fire containment issues such as the use of the latch required to keep the cabinet door closed or the sealing gasket used to form the seal between the dryer door and the front of the cabinet. The only reference to the latch is that it must pass the door and catch test. The test simply consists of a direct pull on the handle or push on the interior door of the door shall not exceed 18 pounds to open the door.

In reviewing the ANSI Standards for gas dryers and UL Standards for electric dryers there is currently no requirements in the Voluntary Standards, to prevent accumulation of lint within a dryer, whether in proximity to the heat source or at any other locations within the dryer. A review of the standards also indicates that there is no information regarding the accumulation of lint within a dryer and the prevention of that accumulated lint from ignition.

Just because an Electrolux dryer is UL stamped does not mean it is necessarily safe or passes the standard. UL states, "A product, which complies with the text of the standard will not necessarily be judged to comply with the standard if, when examined and tested, it is found to have other features, which impair the level of safety contemplated by these requirements".

Electrolux's dryers do not comply with the UL standard in regards to warnings or instructions. UL 2158, Section 7.1.1.3 states: "A cautionary marking intended to instruct the operator shall be legible and visible to the operator during normal operation of the appliance. A marking giving servicing instructions shall be legible and visible when such servicing is being performed." Electrolux, in its User's Guide, instructs that the dryer and exhaust be serviced approximately every 18 months to prevent fires. On the freestanding dryers, there are no cautionary marking at all that instruct the user to have the unit professionally serviced approximately every 18 months, only an instruction to regularly inspect the exterior vent and keep it clear of obstructions. Furthermore, there are no markings on either the freestanding dryer or the Laundry Center that instructs the operator how to remove the lint from hazard areas or from where lint should be removed. Electrolux's Product Safety Engineer for its Laundry Division, Carl King, and the corporation's liaison with UL, admitted in testimony that these dryers fail to comply with UL 2158, Section 7.1.1.3

As previously discussed in the User's Guide section, UL discusses User Maintenance Instructions under section 7.5.1, "The User Maintenance Instructions shall include explicit instructions for all cleaning and servicing that is intended to be performed by the user, such as lubrication, adjustments, or removal of lint, dust, or dirt". The User's Guides for the Electrolux dryers do not discuss how the user should remove the dust and lint, which collects behind the drum and in other inaccessible areas.

UL has a blockage of lint screen and exhaust test listed under section 19.5. This test discusses the operation of the dryer with a lint screen blocked at 75% and 100% as well as an exhaust that is blocked at 75% and 100%. The appliance tested shall have no:

A. Emission of flame or molten metal
B. Glowing or flaming of combustible material upon which the appliance may be placed or that may be in the proximity to the appliance as installed or
C. Indication of flame or glowing embers in the load of clothes either before or after the access door is opened.

This test is completed on a brand new dryer and not an aged dryer. When the exhaust is restricted, the temperature behind the drum is substantially raised. The higher temperatures behind the drum, at the heating element, can ignite lint that collects in close proximity to the heating element in dryers that have been in use for a period of time. The UL testing does not account for lint that collects in the area of the heat source in the Electrolux designed dryer, a fuel that is not present when brand new dryers are tested to undergo UL certification.

CONSUMER PRODUCTS SAFETY COMMISSION:

Overview of Dryer Related Documents

The Consumer Products Safety Commission has published several documents with regards to residential clothes dryers and the risk of fire and has concluded:

- Lint accumulates within all designs of dryers
- Lint can collect in locations near heat sources
- Lint is combustible
- Accumulated lint poses a fire hazard
- Once ignited, burning lint can then ignite the laundry load or lint elsewhere within the dryer
- There are no requirements in the current Voluntary Standards, UL and ANSI, to prevent lint accumulation within a dryer or to prevent ignition of lint.
- Most users only follow the basic maintenance practice of cleaning the lint screen between loads. The interior of clothes dryers are rarely cleaned, only when some other need for service occurs.
- Most clothes dryers are installed using flexible duct materials. The majority of users do not regularly clean their dryer ducts.
- Safety devices, such as airflow monitoring devices and maintenance reminders could increase fire safety with residential clothes dryers.

February 1999 Report on Electric and Gas Clothes Dryers

In the summary of its February 1999 "Report on Electric and Gas Clothes Dryers", the CPSC expressly states:

- CPSC tests, as well as other sources such as clothes dryer design engineers and fire investigators, indicate accumulation of lint both in the lint screen and in the external vent system reduces the flow of air through the dryer and causes internal temperatures to rise. Because the dryer continues to function without any warning to the user (other than ineffective drying of the clothes), the electrical components become thermally stressed, setting the stage for a failure to occur and start a fire.
- A recent design feature called a Lint Alert is presently available on some dryer models. This is a mechanical device intended to produce a sound that warns users of excessive lint accumulation on the lint screen. At present such a device is neither part of the safety standard, nor incorporated in all presently available models and makes of clothes dryers. Incorporating a requirement for an effective lint alert may be a starting point for a solution by alerting the user of elevated temperatures inside clothes dryers.
- Incorporating a restrictive airflow detection system that shuts down the appliance when the exhaust air from the appliance is insufficient is a measure that would more completely address the fire risk.
- It is the view of the CPSC staff that systems should be included in clothes dryers that essentially shut down the dryer when airflow is obstructed.

May 2003 Report on Electric Clothes Dryers and Lint Ignition Characteristics

In the Executive summary of its May 2003 "Final Report on Electric Clothes Dryers and Lint Ignition Characteristics", the CPSC expressly states:

- Lint begins to accumulate inside of the dryer chassis upon first use. Lint Accumulates on the dryer's components, including the heater and the dryer floor. This accumulation occurs even when the dryer's lint screen has been cleaned after each usage, and the dryer is properly exhausted.

Regarding the potential for ignition of lint that has accumulated within a dryer, CPSC expressly states in the May 2003 report:

- Lint accumulating near the heater intake can ignite before the high-limit thermostat switches the heater element off.
- Lint ingested by the heater and embers expelled from the heater outlet can easily ignite additional lint or fabric in the air stream, resulting in additional embers in the dryer system and exhaust vent.

Contrary to the contentions of Electrolux, notwithstanding a dryer's compliance with ANSI and UL standards, the Wright Group agrees with the CPSC's findings that lint can and does accumulate and ignite within the cabinet of a dryer from the time of its very first use. This occurs despite regular cleaning of the lint filter and proper exhaust of the dryer.

Consumer Opinion Survey on Clothes Dryer Installation and Maintenance

The Consumer Product Safety Commission conducted a Consumer Opinion Survey, # 3, and issued a report on their findings in September of 2010. A review of that documentation indicates that over 64% of the customers surveyed used flexible accordion-type duct for all or at least a portion of their dryer vent. The survey also revealed that only 38% of the respondents ever clean their ducts. Of 358 respondents, only 71 had the interior of the dryer cabinet cleaned. Of those 71 persons, 8 reported that the dryer had only been cleaned because of another service reason. In total, only 20% of respondents that participated in the survey performed all of the tasks recommended by residential clothes dryer manufacturers through the Association of Home Appliance Manufacturer's dryer maintenance checklist. The report concludes that the survey supports that most users will only complete those maintenance tasks that are easiest to perform on their own and that do not cost them a monetary expense through a professional service company. The CPSC report also clearly indicates that the results were based on data collected from a convenience sample, not a random sample. Therefore, "*because voluntary registration via the CPSC website is the only method by which consumers can participate in the survey, the staff believes that this respondent population is more likely to show an interest in product safety and to be more aware of safety issues than the general public. Unsafe behaviors or low hazard*

perceptions among this population would most likely point to problems that would be even more prevalent among the general consumer population."

The document outlines numerous other statistics and supports our opinions that it is foreseeable that the average user is unaware of the fire hazards associated with residential clothes dryers in regards to their installation and maintenance. This type of consumer survey information could have been obtained by Electrolux to better assist in the design of a dryer that relies more on the principals of Safety Engineering, in that many of the associated hazards relating to problems they fault the user for can be eliminated or significantly reduced through engineering.

The survey completed by the Consumer Product Safety Commission, is consistent with the Electrolux Service Bulletin dated November 2000, which indicates most people use flexible foil ductwork in their dryer installation. It is well known to Electrolux and other manufacturers in the industry that flexible ductwork is commonly and consistently used in the majority of dryer installations. This is because flexible ducts are installed by professionals or sold by retailers and supplied to homeowners that install the dryers themselves.

CPSC Evaluation of Using Indicators to Inform Consumers of Clothes Dryer Status

In a report issued by the CPSC in June 2011, the CPSC used their September 2010 study as a basis to establish a recommendation that safety devices in clothes dryers could lead to better maintenance practices by the user to assist in the reduction of lint-related fires in clothes dryers. The following are the conclusions as reported in the June 2011 CPSC report:

> *"Consumers report that they usually clean their clothes dryer lint filters; however, they also report that they typically do not clean the ducting or inside the dryer cabinet. Failure to clean ducts and airways is among the leading factors associated with clothes dryer fires. Lint can accumulate inside a dryer even when a dryers lint screen has been cleaned after each use and the dryer is properly exhausted. Lint accumulating inside the dryer cabinet and in contact with the heater can potentially lead to a fire.*

As seen in consumer related incidents, a dryer can be operating in an unfavorable mode for an extended period of time until the situation escalates into a more hazardous scenario. Clothes dryers commonly do not include any form of operating status indicators. Indicators that remind consumers of maintenance tasks or warn that the clothes dryer is not operating normally, could offer customers valuable information that might improve clothes dryer safety.

Maintenance indicators could be used to remind consumers to clean inside the dryer chassis and dryer duct. Counting dryer loads is one easy method that can be translated to an indicator to remind consumers when a task needs to be performed – check and clean the exhaust exit, exhaust duct and inside the dryer cabinet. The specific number of times that a dryer can run before a check or cleaning task needs to be performed would be manufacturer and dryer design specific.

An 'abnormal operation' indicator could provide customers with information about a potential hazardous condition. Normally, clothes that do not dry may be the only indication to a customer that a dryer is not operating correctly. The dryer can enter into a high limit cycling mode from a number of conditions, such as an overloaded dryer, a blocked exhaust duct, or a blocked lint screen. Feedback on the status of the high limit thermostat would be a valuable indicator that service needs to be performed on the dryer system.

Using indicators to tell the customer that maintenance and service are required on the clothes dryer can potentially reduce the number of fire related incidents involving clothes dryers."

The Wright Group agrees with this CPSC documentation and the use of indicators to inform customers regarding the status of their dryer. As previously discussed, the use of written warnings and/or instructions is the least preferable method to protect against a hazard. The use of engineered active warning device would be the preferable method to warn the user of abnormal operating conditions and assist in the prevention of lint-related fires in any clothes

dryer, and particularly in the subject Ball Hitch design employed by Electrolux where the design allows for the accumulation of lint in proximity to the heat source behind the drum where it cannot be observed or removed by the average user.

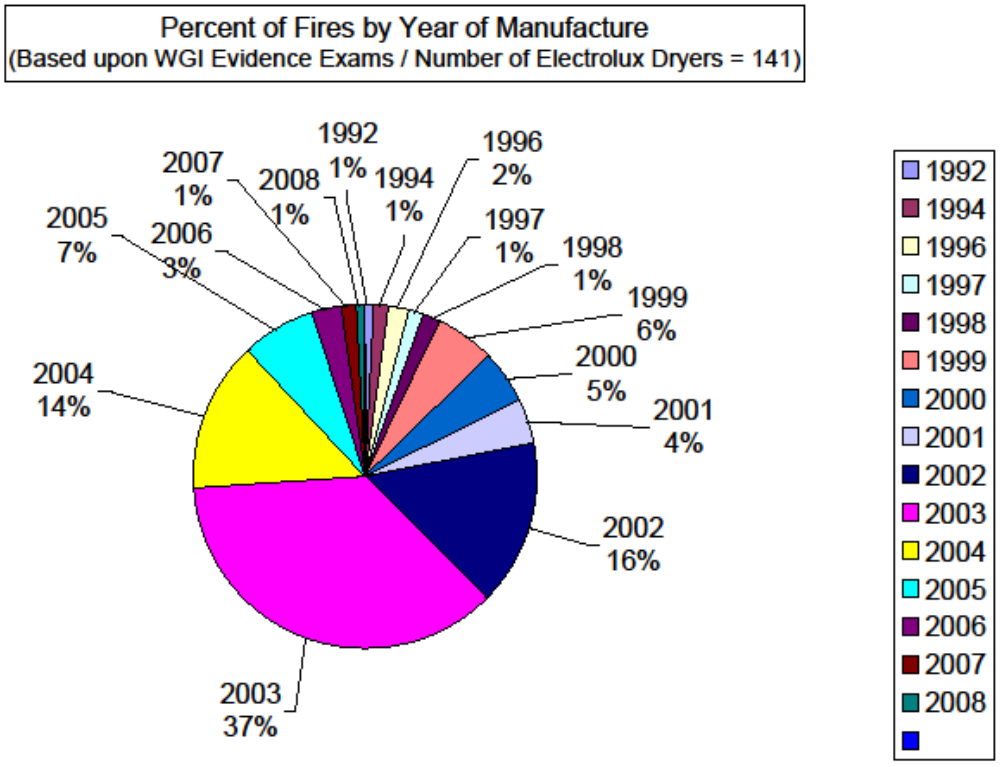
UNIVERSITY OF KENTUCKY REPORT:

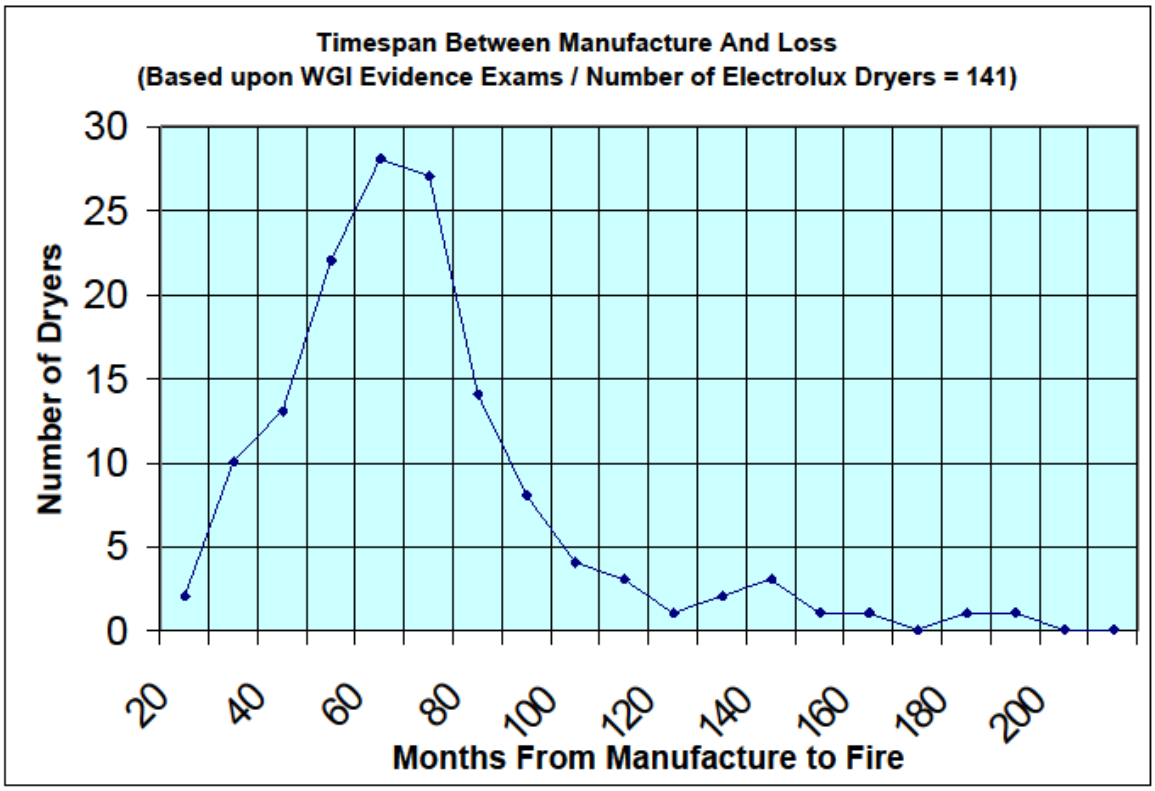
The University of Kentucky Report, dated August 1992, was the evaluation of spontaneous combustion of laundered fabrics soiled with vegetable oil. The purpose of this evaluation was to examine the potential for spontaneous combustion of vegetable oil soaked terry cloth towels after simulated consumer laundry conditions. A review of the entire document indicates that there were no resulting fires from clothes that were tumbling in a dryer and the clothing did not reach any abnormal temperatures. Based on the results of this evaluation, vegetable oil saturated towels laundered in extreme conditions i.e. cold water wash will retain up to 48.3% W/W oil after laundering. But for all of the oil/fabric combinations evaluated during this investigation, spontaneous combustion did not occur in the clothes dryer. Nor did spontaneous combustion occur in the storage of a load that had been dried in a clothes dryer and stored in a laundry basket. Only after the load was removed and heated in an oven at 200°F did any of the laundry items achieve spontaneous ignition. The only other condition in which spontaneous combustion occurred was when sunflower and soybean oil soaked towels were washed and lined dried then heated in an oven. The corn oil soaked towels did not combust under these same conditions.

STATISTICAL DATA:

Statistical data was also compiled using these burned Electrolux dryers. For a group of 141 Electrolux dryers involved in fires (both gas and electric models), the following charts outline the percentage of fires based upon the year the dryer was manufactured and the time span, in months, between the date of manufacture and the date of the fire. The greatest frequency of fires occurred in a general range from 3 to 6.5 years, with the highest number of fires occurring approximately 5 years after the date the dryer was manufactured. The greatest percentage of dryers based upon the year of manufacture occurred after Electrolux altered the felt front seal. Similar statistical analysis has been conducted by some of our peers, including Fire Findings

Investigations and the Traveler's Insurance Laboratories. Their findings were substantially similar to the Wright Group's statistical analysis. It should be noted that this statistical data was compiled in May of 2010, using data collected from Electrolux dryers we examined from 2007-2009. The 141 dryers cited in this study currently represent only a small fraction of the several hundred Electrolux dryer cases we have been involved in, yet the average age of these dryers consistent at approximately 5 years of age when they experience fires.





Testing

The Wright Group has conducted a large amount of testing on the Electrolux/GE designed dryers. Much of the original testing involving the principles shared between the General Electric and Electrolux dryers has been conducted over the last 15 years. Due to the increased amount of Electrolux dryers the Wright Group has been exposed to over the past several years, some of the GE testing performed by the Wright Group was reduplicated on Electrolux dryers. Other testing has been added to address specific fire related issues with the Electrolux dryers, while other testing has been conducted in response to Electrolux's experts' opinions and testing. Some of this testing has been performed in conjunction with our peers, or has been reviewed by our peers. Similar testing conducted separately by our peers have produced similar results and are the basis for our opinions regarding fire cause related to the subject dryer, analysis of the inherent fire hazards associated with the Electrolux design, and opinions regarding ignition, growth and spread of fire within and out of the subject Electrolux dryers.

All of the testing conducted by the Wright Group has been thoroughly documented using video, photographs, measurements, thermocouples, volumeters, etc. The data has been analyzed and has been the basis through which our initial hypotheses were validated. All of the opinions of Wright Group, Inc., in regards to the cause of the fires in the dryers manufactured by Electrolux, are a result of the thorough understanding of these appliances through baseline testing and actual fire testing.

The testing conducted by Wright Group that is specific to Electrolux includes:

- Fire Propagation and Spread Testing – September 2007
    - Conducted to validate the transfer of heat energy from the first fuel to the secondary fuels within the appliance and then to the spread fuels outside of the dryer.
- Gas Dryer Flame Height and Lint Ignition Testing – September 2008 **(Appendix III)**
    - Conducted to simulate the effect of lint accumulating on the burner and the changes that occur in the premix ratio of fuel to air in a normally operating burner compared to that of a burner with a partly or fully blocked air intake.
- Baseline Temperature Testing and Airflow Testing – November 2008
    - These tests were conducted under normal operation to document the operational characteristics of these dryers. Testing was conducted using various restrictions of the ventilation components, to simulate various amounts of restrictions or even complete blockage. The operational thermostats and high limit safety devices were tested using the same variations of restriction. Comparative analysis was performed to test the amount of restriction an actual load places on the volume of air output from the dryer. Thermocouple data was collected to show the variation in temperature at various points throughout the dryer, in unaltered dryers and through the use of simulated restriction percentages.
- Electric Dryer Lint Ignition and Fire Growth Testing – November/December 2008
    - Lint ignition scenarios were tested to validate the current opinions regarding the ignition scenarios. Fire testing was conducted regarding the flammability of components as well as fire containment issues.

- Gas Dryer Alternative Design Testing – December 2009 **(Appendix V)**
    - The Wright's Group's design alternative using a metal guard was installed on a gas dryer and tested. The purpose of the efficiency testing was to verify that the modification did not subtract from the efficiency of the dryer. Multiple time/temperature tests were conducted to verify that it took the same amount of time for an identical load to be dried in an unmodified dryer as it took in the alternative design
- Dryer Exhaust Testing – July 2010 **(Appendix IV)**
    - Conducted to evaluate various external vent duct installations. A manometer was used to measure the exhaust backpressure at the rear of the dryer, as per Electrolux's Installation Instructions. Various configurations of exhaust ducting were applied to both freestanding dryers and laundry centers and measurements were taken. All three types of commonly found exhaust ducts were used: rigid, semi-rigid and flexible foil. The various exhaust configurations included those recommended in the table under the exhaust section of the Installation Instructions. Once the baseline measurements were obtained, the length and number of elbows was increased incrementally until the maximum allowable backpressure of 0.75" W.C. was obtained.
- Electric Dryer Alternative Design Testing – July 2010 **(Appendix V)**
    - The Wright's Group's design alternative using a metal guard was installed on an electric dryer and tested. This design alternative also relocated the heating element from directly behind the drum to the base of the cabinet. The purpose of the efficiency testing was to verify that the modification did not subtract from the efficiency of the dryer. Multiple time/temperature tests were conducted to verify that it took the same amount of time for an identical load to be dried in an unmodified dryer as it took in the alternative design
- Vertical Heat Duct/Heater Pan Temperature Test – August 2011 **(Appendix VI)**
    - Testing was conducted on an Electrolux ball-hitch freestanding gas dryer to document the temperatures attained behind the drum where the vertical heat duct carrying the hot air from the burner tube interested with the heater pan. Two tests were conducted using the same dryer, set to High Heat, with an empty lint screen

and no load. The only variable between these tests were that one test was conducted with no exhaust attached to the dryer and in the other test the dryer was equipped with an exhaust that was set to the maximum allowable exhaust vent restriction of 0.75" H_2O. These exhaust variables were used to achieve the most efficient and least efficient exhausts allowed by the Installation Instructions. The maximum temperatures recorded at the right edge of the vertical heat duct where it intersected the heater pan were 800°F with no vent and 1100°F on the vent with the maximum allowable restriction. Both temperatures exceed the auto ignition temperatures of cotton based lint and support our opinion that lint collected in the heater pan can be auto ignited by heat produced by the burner flame in a properly vented dryer. This data coincides with our September 2008 Lint Ignition test in which we were able to ignite lint targets at this same location in gas ball-hitch dryers.

- Lint Accumulation Testing – May - June 2011 & April-May 2012 **(Appendix VII)**
    - Testing similar to ESI/Electrolux's lint accumulation test on freestanding gas/electric and Laundry Center gas/electric was conducted. The ESI/Electrolux tests used brand new, never used appliances and an ASTM standard test load. The groups of dryers they used were tested using a "properly vented" and a "restricted" exhaust, however, the "properly vented" exhaust was well vented with approximately 0.52 inches of water column backpressure restriction while the "restricted" exhaust was tested at 0.90 inches of water column backpressure. Electrolux's installation instructions allow up to 0.75 inches of water column backpressure in any installation. The Wright Group's testing began in May and June 2011 with a test on a freestanding gas dryer with an exhaust restricted to approximately 0.74 inches of water column, on a dryer in used condition (See Photos 8-17 below), drying loads of 10 brand new cotton bath towels for 20 cycles total and obtained substantially different results, including a much heavier accumulations of lint and a lint fire between 10 and 20 loads. This test was followed by testing on additional dryers using the same protocol, including an unused Electrolux freestanding gas dryer, with the baffle removed, and the seal between the blower housing and exhaust tube taped to prevent any pressurized

release of lint from that joint. The results of this test revealed substantial accumulations of lint in the heater pan after only 20 loads of towels. Testing was performed on another new Electrolux freestanding gas, with the baffle removed, but with no foil tape sealing any internal components (See Photos 1-7 below). This test was done to substantiate that the foil tape did not affect the accumulation of lint within the dryer. The test results revealed nearly identical test results to the previous test, with no increase in the amount of lint released into the cabinet.

Testing using the same protocol was conducted on a used, freestanding, electric clothes dryer manufactured by Maytag and employing the bulkhead design in June 2011 (See Photos 18-22 below). The results of this test were that absolutely no lint accumulated within the heat duct that carried heated air into the rear of the drum from the heating element. And in May 2012, this testing was conducted on brand new gas and electric models of the Frigidaire Affinity bulkhead design of clothes dryers manufactured in Juarez, Mexico. The results were the same as with the Maytag design; no lint collected in the air stream between the heat source and the drum inlet at the rear of the drum.

This protocol was used in testing the RONCO 3 gas dryer prototype to evaluate lint ignition in an Electrolux ball-hitch modified with a guard to prevent lint from coming into contact with the hot gasses and flames produced by the gas burner. During this testing, lint collected in the heater pan as it had in the unmodified Electrolux ball-hitch dryers. Due to the fastening materials used in the construction and installation of the prototype guard, more lint accumulated than would be expected in the heater pan. However, no lint was observed within the extension of the vertical heat duct and the thermal break in the guard that separated the lint in the heater pan from entering the vertical heat duct prevented any ignition of the lint that collected within the modified dryer prototype. This testing confirmed our hypothesis that a guard could be added to the existing design to prevent the ignition of lint by the heat sources in these dryer.

Based upon this testing, it has been demonstrated that the ball-hitch design, used by Electrolux in their dryers, operated without a baffle and with an exhaust system back pressure of less than 0.75 inches of water column (specified in Electrolux's Installation Instructions as "acceptable") accumulate significant amounts of lint in between the heat source and the drum after only twenty loads of ten bath towels were washed and dried. The used Electrolux ball-hitch dryer collected even more lint, and a lint ignition fire occurred during the test. The RONCO 3 alternative still collected lint in the heater pan, but the guard prevented the lint from entering the heat duct and igniting. In contrast, the bulkhead design used by Whirlpool, Maytag, LG, Samsung and now Electrolux, was tested using the same parameters did not accumulate any lint in the path of airflow between the heat source and the drum.

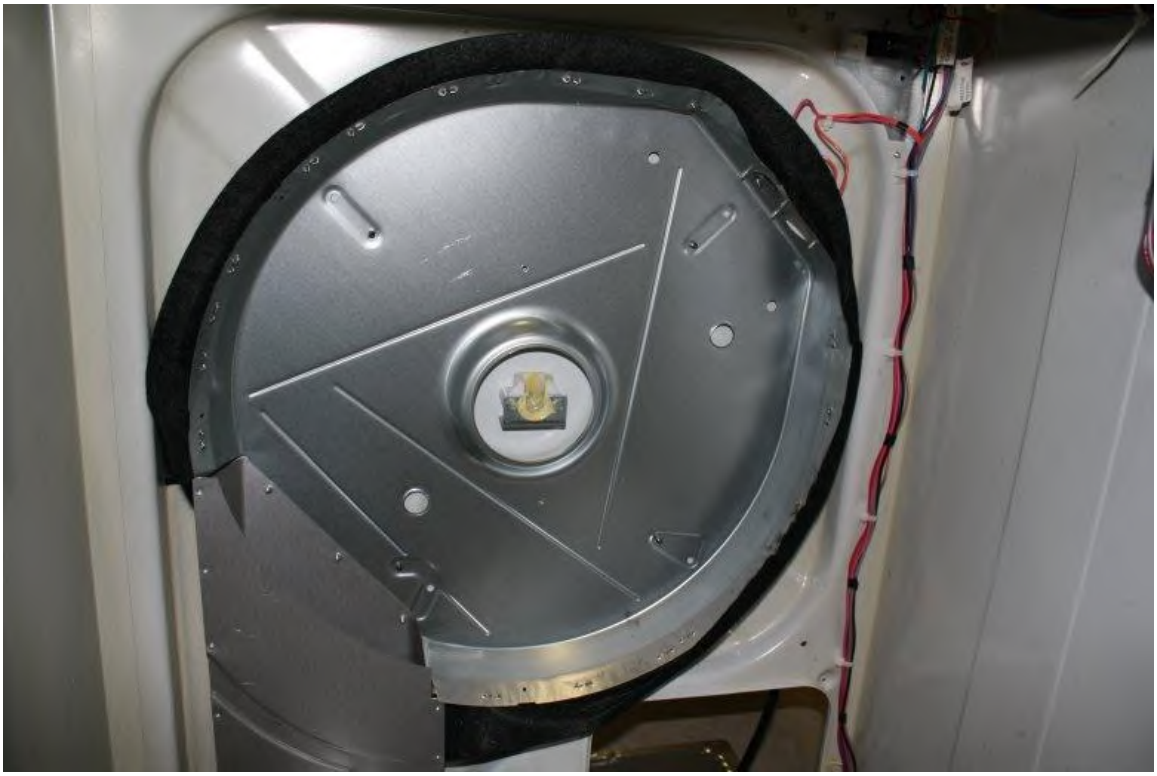


Photo 1: New Electrolux Dryer - Heater Pan before Testing

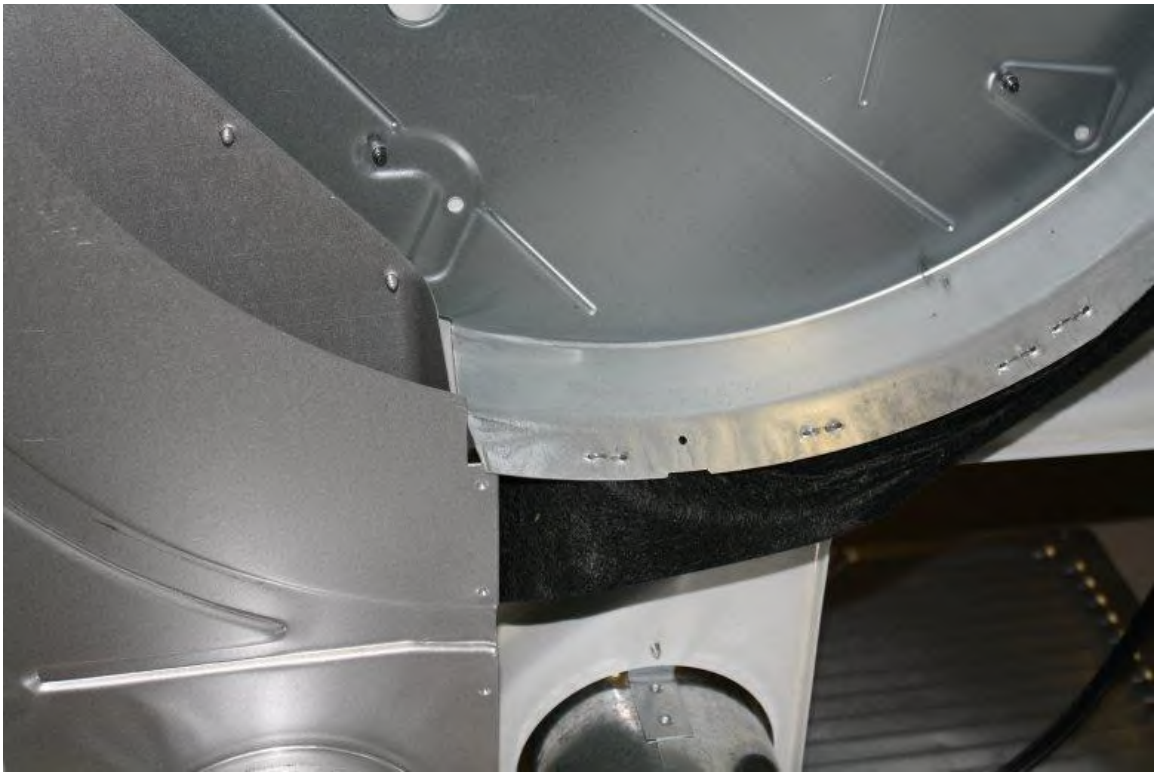


Photo 2: New Electrolux Dryer - Heater Pan before Testing

Photo 3: New Electrolux Dryer – Rear of Drum before Testing

Photo 4: New Electrolux Dryer – Cabinet and Heater Pan after Testing

Photo 5: New Electrolux Dryer - Heater Pan after Testing

Photo 6: New Electrolux Dryer – Lint in Heater Pan after Testing

Photo 7: New Electrolux Dryer – Rear of Drum after Testing

Photo 8: Used Electrolux Dryer - Cabinet before Testing

Photo 9: Used Electrolux Dryer – Heater Pan before Testing

Photo 10: Used Electrolux Dryer – Lint in Heater Pan before Testing

Photo 11: Used Electrolux Dryer – Rear of Drum before Testing

Photo 12: Used Electrolux Dryer – Lint on Rear of Drum before Testing

Photo 13: Used Electrolux Dryer – Heater Pan Testing

Photo 14: Used Electrolux Dryer – Burned and Fresh Lint in Heater Pan after Testing

Photo 15: Used Electrolux Dryer – Layers of Colored and Charred Lint after Testing

Photo 16: Used Electrolux Dryer – Rear of Drum after Testing

Photo 17: Used Electrolux Dryer – Burned Lint on Rear of Drum after Testing

Photo 18: Used Maytag Dryer - Cabinet before Testing

Photo 19: Used Maytag Dryer – Heater and Heat Duct before Testing

Photo 20: Used Maytag Dryer – Interior of Heat Duct before Testing

Photo 21: Used Maytag Dryer - Cabinet and Heater after Testing

Photo 22: Used Maytag Dryer – Interior of Heat Duct after Testing

- Component Burn Testing – October 2013
    - Testing was conducted on dryer parts to evaluate their burn characteristics when exposed to flame. The parts chosen were the major component parts used in Electrolux dryers located at the lower right front corner including the air duct (otherwise referred to as the trap duct), the blower housing and the fan impeller which were all manufactured from plastics. Since Electrolux has manufactured these plastic parts from plastics with varying levels of fire retardants, specimen parts from different dryers and vintages were used. The purpose of this test was to determine the burning characteristics and ability to self-extinguish between these parts, based upon their configuration and the type of plastic they are constructed of. Testing was also conducted on similar parts used in a Whirlpool clothes dryer, as a comparison. All of the testing was documented with photographs and video.

      Testing was conducted on the air duct (trap duct), blower housing and fan impeller from the most common models of Electrolux Ball-Hitch dryers, i.e.

Frigidaire freestanding clothes dryers manufactured from approximately 1996 through 2011, (Alliance platform) which were all manufactured from HB rated plastics with no fire retardants. This allowed all of these components to be easily ignited with a short duration flame (30 seconds) when exposed to a Bunsen burner. Once ignited and with the flame removed, these HB plastic components became fully involved in fire. The burning plastics dripped flaming molten plastic and the pooling plastic material sustained a surface flame that spread outward from each component. Even with the flame removed, the combustion process continued until the structure of each component was consumed. In some cases, the majority of HB rated plastic was consumed and all that remained was a small pool of remaining material. These HB rated components burned continuously for long durations; the HB air duct burned for approximately 65 minutes and the HB blower assembly burned for approximately 30 minutes.

Testing was conducted on an air duct (trap duct) from a GE Ball-Hitch dryer, manufactured by Electrolux to comply with GE's internal fire drum-fire containment test, the GE SEE test. The 5V plastic air duct ignited when exposed to flame but self-extinguished when the flame was removed. Only by continuously exposing the 5V air duct to continuous flame in one spot did the combustion process continue. However, when all of the HB plastic materials exposed to the area of the flame were consumed, the 5V material self-extinguished and the majority of the fire retardant 5V plastic material of the air duct survived the testing. It is also important to note that there was no flaming molten plastic formed during this test of the 5V air duct. The 5V air duct only burned for approximately 4 minutes during constant exposure to the outside flame source before the material exposed to the flame was consumed and the component self-extinguished.

Testing was conducted on a blower assembly from an Affinity 7.0 Cu. Ft. Bulkhead dryer, manufactured by Electrolux to comply with the drum-fire and base-fire containment tests outline in the UL 2158 Electric Clothes Dryer

standard, which came into effect in March 2013. In order to meet the minimum standard of the new fire containment testing, Electrolux used tape to seal openings in the base of the cabinet, used expanding fire sealant between the cabinet and the front panel at the lower right front corner and changed some of the internal components to fire retardant 5V plastics, including the air duct and blower housing. However, since the fan impeller remained manufactured from non-fire retardant HB plastic, we tested the blower assembly. The 5V plastic blower housing ignited when exposed to 30 seconds of flame from the Bunsen burner and self-extinguished when the flame was removed. However, when exposed to flame for 60 seconds, the 5V material had been partly consumed and the HB plastic fan impeller inside of the blower housing was ignited. When the flame was removed, the 5V plastic exposed to the Bunsen burner flame self-extinguished but the HB plastic fan continued to burn without any additional external heat source. The continuously combusting HB fan caused the 5V plastic surrounding the fan to burn while it was subjected to the energy of the burning HB plastic. However, when all of the plastic materials in the area of the fan at the right side of the blower assembly were consumed, the 5V materials at the left side of the blower housing self-extinguished and some of the 5V plastic material of the air duct survived the testing. The blower assembly burned for approximately 122 minutes, the majority of which was due to the HB fan burning encapsulated within the 5V blower housing.

A steel air duct from a Whirlpool Bulkhead dryer (recommended alternative) was tested using the same methodology and set-up. There was no ignition of the steel. The plastic fan impeller from a Whirlpool Bulkhead dryer was also tested on an individual basis. The plastic material of this fan displayed more resistance to ignition by the flame in the Bunsen burner testing than the Electrolux HB fan impeller did. Based upon our observations, the Whirlpool fan may have been made out of V-1 or V-2 plastics, which have some fire retardant properties. However, in this component's form, combustion continued without additional flame necessary until the plastic was mostly consumed after approximately 31

minutes. In its intended configuration, surrounded by a steel blower and air duct assembly, this fan would not be easily ignited and if it were, the surrounding components would add an additional layer of fire containment.

Based upon the results of this testing, our opinions that the use of alternative materials would be effective in containing the fire to the cabinet in most conditions, particularly in the Electrolux Ball-Hitch dryer fires where the fire transfers to the lint collected in and around the air duct and blower assembly located at the right front corner of the Ball-Hitch dryer. Had Electrolux used steel components, they would have been most effective in containing fires within these dryers and would not have added additional fuels to the fire. Though less effective, had they manufactured the major plastic components at the right front corner of their Ball-Hitch dryers, including the air duct, blower housing and fan impeller out of 5V fire retardant plastics, their design would have improved. In some circumstances, small fires would not have the energy to ignite the 5V plastics. In other cases where there is enough heat to ignite the 5V materials, the fuel load would be limited by 5V's ability to self-extinguish. Another substantial benefit of 5V plastic over HB plastic was the elimination of HB's characteristic of flaming molten material, which increases the probability of flaming material escaping the cabinet to ignite surrounding combustibles.

- Fire Containment Testing – October 2013
    - The purpose of this test was to test Electrolux's Ball-Hitch dryer, as produced in its common configuration to determine if it would pass a base-fire containment test. Testing was conducted on a common model Electrolux Ball-Hitch dryer, i.e. Frigidaire freestanding clothes dryer (Alliance platform), with all plastic components at the right front corner manufactured from HB rated plastics with no fire retardants. Due to the fact that the dryer used for testing, Model FDE216RES1, Serial XD85175981 was manufactured in 1998 and was equipped with a blower housing with a steel face plate, the blower housing was changed to an all HB plastic version. This test dryer was in used condition, but all lint was cleaned from the dryer. This test was conducted with the dryer off, not connected

to any electrical supply and with no load in the drum. This test was documented with photographs and video, with videography recorded via two external cameras and two cameras within the base of the cabinet.

Per the UL 2159 Electric Clothes Dryer standard's base-fire containment test protocol, 8 layers of cheesecloth was inserted within the base of the dryer cabinet, in the immediate area surrounding the front and sides of the blower assembly and below the trap duct. A minimal footprint of cheesecloth was used within the cabinet to limit that amount of combustible material added to the dryer. A 1" wide trailer of 8 layers of cheesecloth was laid in the cabinet to transmit the open flame, applied by butane lighter at the left rear corner of the cabinet, to the cheesecloth at the right front corner. The dryer was wrapped in a single layer of cheesecloth, including a layer over the non-combustible the dryer was situated on for the test.

Upon ignition with a butane lighter, flame traversed the base of the cabinet via the cheesecloth trailer, in turn, igniting the cheesecloth at the right front corner, within approximately 2 minutes. The fire ignited the plastic materials in the area at the right front corner where the plastic trap duct mated to the plastic blower housing approximately 3 minutes later. Once the HB rated plastic was ignited, the plastic did not self-extinguish and the flames grew. After approximately 3 additional minutes, the flaming molten plastic escaped through the bottom seam between the front panel and cabinet, immediately igniting the cheesecloth covering the appliance. Per the UL 2158 test standard, the ignition or any visible heat damage to the outer cheesecloth covering constitutes a failure of UL's fire containment testing. During our test, the dryer was allowed to burn for several more minutes before being extinguished, during which time the commonly observed fire patterns formed at the right front corner from the non-fire retardant HB plastic components in that area continuing to burn.

The results of the test confirmed our opinions that the subject design of Electrolux Ball-Hitch dryers fails to contain a fire originating in the base of the dryer for any reason. A small fire in the base of the cabinet that originates from any fire cause, with a minimum amount of easily ignitable lint acting as the catalyst, will ignite the plastics in the base of the cabinet. The test also revealed that the inappropriate use of HB plastics with no fire retardants assisted in the spread of fire outside of the cabinet, as the flaming molten plastic escaped through the seam and ignited the outer cheesecloth.

Review of Opinions with Other Experts

The Wright Group has consulted with other fire origin and cause experts across the country in many of the numerous Electrolux dryer fire cases in which we have been involved. The Wright Group's opinions as to ignition scenarios, lint accumulation, design defects and warnings are substantially similar to independent opinions offered by other experts. Electrolux's own experts, including those from Pyrtech, Inc., have offered their expert opinions that the ignition of lint occurs behind the drum and spreads to the load in the drum and/or lint and plastic materials in the trap duct. We have compared our testing, data and opinions with Fire Findings Investigations, Inc. and Traveler's Insurance Laboratories, two independent labs that have investigated dryer fires in hundreds of Electrolux dryers and found that their experts concur with our opinions.

Fire Findings Investigations Report for a Gas-Fired Electrolux Dryer, Dated February 17, 2011:

In the Kelly and Rodney Slabach/State Farm Insurance Vs. Electrolux Home Products case, U.S. District Court – Northern District of Indiana, Case #: 3:08-cv-00436-WCL-CAN, Jack Sanderson of Fire Findings Investigations conducted his own origin and cause analysis for the fire and determined that the fire originated from within the subject gas-fired Frigidaire dryer, manufactured by Electrolux. We have reviewed this report and agree with all of the opinions Mr. Sanderson expressed in his report *(Listed as 1 through 8, pgs. 2-5).* Both the Wright Group

and Fire Findings Investigations have conducted thousands of hours of independent and analysis and testing of burned and unburned Electrolux dryers and have authored nearly identical opinions on the key flaws in the design of the subject designs of the dryers manufactured by Electrolux.

Scott Jones, P.E., of Engineering Investigation, Reports for Electrolux Dryers:

In recent cases, the Wright Group was provided the opportunity to consult with another independent engineer, Scott Jones, P.E., of Engineering Investigation, LLC, who reviewed the data and formed his own opinions involving the Electrolux manufactured dryers that were involved in fires. Mr. Jones is a licensed Professional Engineer and worked for a major appliance manufacturer designing laundry products. In his reports, Mr. Jones determined that Electrolux's design is defective in that lint collects near the heat source and can be ignited by the heat source. Mr. Jones also evaluated the Wright Group's alternative design changes to the Electrolux gas and electric dryers (RONCO 3 & RONCO 4). The following is an excerpt from the Summary of one of his reports: **(For his full reports, see Appendix VIII)**

> *"The present Electrolux laundry center dryer design promotes lint accumulation at multiple locations along the air flow path through the unit. The accumulations present a latent hazard to property and life when the first fuel (particulate/lint) accumulations are ignited by the nichrome heaters. The ensuing fire gains additional fuel from particulate accumulations between the drum and radiant heat shield. The fire is drawn into the drum and the lint filter. The incandescent particulate eventually settles on lint/particulate collection at the blower inlet, which extends the fire throughout the dryer enclosure.*
>
> *The potential for fire can be absolutely eliminated from the present design by isolation of the first fuel (i.e., particulate/lint) from the ignition source (i.e., nichrome heater. Electrolux shifts the burden of isolation to the end user by requiring periodic cleaning of the unit in an unspecified manner by unspecified personnel at unspecified location(s) within the unit. The lay consumer would not recognize the latent danger to life and property inherent in the present design and consequently the design is considered to be defective.*
>
> *As demonstrated by RONCO 3 and RONCO 4 proof-of-concept units, a relatively simple but ingenious design change using concepts, materials and methods that have been known for many years before the production of the present dryer could have prevented the mating of the first fuel and ignition source in the present fire. The proof-of-concept units offer decreased material and production cost to the manufacturer."*

CONCLUSION:

Fire Cause

The fire originated within the interior of the dryer and traveled to the exterior of the dryer. Inspection of the interior of the dryer showed that the fire originated downstream of the gas burner, between the combustion chamber and the rear heater pan assembly. The first fuel ignited was the lint that had accumulated behind the drum in the heater pan area/rear of the drum. This burning lint ignited secondary fuels in the dryer, including the lint accumulated in the air path downstream of the drum and the plastic internal components of the dryer and the laundry load. Burning plastic components within the base of the cabinet provided sufficient heat energy to attack and compromise the gas valve, allowing for the unchecked release of natural gas within the dryer until the gas supply was shut off during firefighting efforts.

This writer has ruled out other ignition sources. All other possible sources of ignition were carefully considered and eliminated. Other sources of ignition considered were:

1. Electrical ignition sources including the motor, wiring, and electrical components were examined and eliminated. There was no electrical activity observed on the internal wiring or components. This indicated there were no electrical ignition sources that were the cause of this fire.
2. There was no evidence of mechanical failures or frictional heating. The drum pivot and bearing assembly were undamaged. An inspection of the electric motor indicated that there was no obvious evidence of any malfunction of the bearings.
3. There was no evidence of any gas malfunction at the burner assembly and no reports of any overheating, delayed ignition or explosions prior to the fire.
4. Contamination of the clothing load by combustible/flammable liquids and materials prone to spontaneous ignition was eliminated as the cause of this fire. All evidence supports that the dryer was running at the time of ignition. With the dryer running, spontaneous ignition cannot occur. The laboratory analysis of the load remains also did

not reveal the presence of any contamination of the laundry by ignitable liquids or materials prone to spontaneous combustion.

In summary, this fire was caused because the Ball-Hitch design of the dryer actually promotes the accumulation of the combustible material (dryer lint) within close proximity of a competent ignition source (gas heat source).

The ignition scenario has been narrowed to one of the following events:

1. Over the lifetime of use leading up to the fire, lint accumulated within the heater pan, by the tumbling of the laundry within the drum and against the perforations at the rear of the drum. The lint was further trapped in this void space by the felt seal between the heater and rear of the drum. This lint accumulation was ignited by the heat energy produced by the burner flame as it exits the burner tube and enters the heater pan before being pulled into the drum. Once the lint came into contact with the heat source, the lint ignited.
2. Alternatively, the lint that had adhered to the rear of the drum or in the heater pan might have loosened, dislodged and come into direct contact with the burner flame because of the tumbling drum, airflow or any other jarring action such as opening or closing of door, placing laundry basket on top of dryer, etc.

In either case, once the lint to the rear of the drum came into contact with a heat source, the lint ignited. This first lint ignited other combustible materials in the dryer, which would have included the laundry load in the drum, lint in the lint trap duct area downstream of the drum and the internal plastic components at the right front portion of the dryer cabinet. Once the plastic internal fuel was ignited, the heat release was sufficient to impinge upon and compromise the gas valve for the burner assembly, also nearby in the base of the cabinet. As a result, heat and flame escaped the cabinet igniting surrounding materials outside of the dryer cabinet.

Design Defects and Warnings

Based upon Wright Group, Inc.'s ignition scenario, we have determined the following:

1. **Design:** Electrolux is responsible for this fire in part due to its failure to design the hazard out of the subject dryer, design an engineered guard or safety to prevent or reduce the possibility of fire, and its failure to warn the user of the known fire hazards. If Electrolux had followed the basic safety engineering principles, it would have designed the hazard out of the dryer or guarded against it, instead of solely relying on user instructions to prevent these fire hazards. As outlined in the hierarchy of safety engineering principles, user instructions are the least preferable method for addressing product safety hazards.

   The Ball-Hitch design of the dryer is unreasonably dangerous. Heat is required as part of the drying process and lint is a known by-product of the drying process. Electrolux's Ball-Hitch design inefficiently manages the lint produced during the drying process and allows for lint to accumulate in areas where it is in close proximity or direct contact with the heat source of the dryer (gas flame in a gas fired dryer, or resistive heating coil in an electric dryer). Other manufacturers' dryers (Bulkhead design) also produce lint, but the lint does not collect at or near the heat sources. Furthermore, the lint that is produced in the Electrolux design collects in areas that are not visible to, or serviceable by, the average user. While a high limit safety device is installed to prevent an overheat condition within the dryer, this ignition scenario does not require an overheat condition and can occur during normal operation of the appliance. There are no safety devices to monitor the accumulation of lint, or to disallow the use of the dryer when excessive lint build up occurs. While improper or inadequate installation or maintenance might contribute to the reduction of airflow and the accumulation of lint, such circumstances should only result in performance problems in a safely designed dryer, not manifest into a fire hazard as in the Electrolux dryer. As of March 2011, Electrolux now only produces freestanding dryers that use the Bulkhead style design. Electrolux does not produce any Ball-Hitch style dryers like the subject dryer. The alternative design (Bulkhead) was

available at the time the subject clothes dryer was manufactured, as other manufacturers have used it for over 50 years. Carl King, Electrolux's own in house Safety Engineer, has stated in other deposition testimony that there have been no reports of any fires in Electrolux's new design of Bulkhead dryers.

There is also an additional defect in the design of these dryers related to the combustible materials that the dryer is constructed of. The use of plastic components adds a significant quantity of secondary fuels to the appliance and also allows for fire to more easily spread out of the cabinet. These plastic components include the plastic lint screen and lint filter housing, the plastic trap duct, the plastic blower housing and fan impeller, the plastic components of the door latch assembly, the plastic door seal and the control console trim. Although in this case, the plastic trap duct was manufactured specifically for GE using a flame-retardant plastic, it still was consumed during the fire. If the internal components were constructed of fire proof or fire resistant materials then much of the secondary fuel would not be present and any small scale lint fires that do not ignite the load would be contained within the cabinet and burn themselves out. Steel door latches and a woven fire resistant gasket (typically found on oven doors) would greatly improve the possibility that the door would remain closed and the release of smoke, flame and hot gasses from the drum opening would be greatly reduced. Even the use of plastics with a greater degree of fire resistive properties, such as a thermoset plastic that chars when exposed to high heat, would add additional protection against the growth of fire in the cabinet and fire spread from the cabinet. In fact, in the dryers made by Electrolux for General Electric under GE branding, GE required Electrolux use plastics with better fire resistive properties after failing a drum load fire containment test. While Electrolux changed the plastic materials for the GE branded dryers, they made no changes to the plastics in dryers manufactured under any other brand names. However, in this case the change of the plastic trap duct alone did not assist in containing the fire to the appliance. This is because Electrolux failed to conduct any further testing of their dryers to simulate the effects of an expected accumulation of lint in the trap duct and what would occur if that lint was ignited during operation; an entirely different scenario

of a burning drum load in a brand new dryer with no lint as they tested for the GE models alone.

Since the function of a clothes dryer is to dry a load of clothing within the drum, there is an expectation of a certain amount of inherent fuel within the drum because of the clothing inside. In this case there was nothing to indicate that the dryer was overloaded, therefore, the unnecessary quantity of combustible plastic internal components was the proximate cause of fire escaping containment of the dryer cabinet.

2. **Warnings and Instructions:** The warnings on the dryer do not advise the user that lint collects near the heat source and can be a fire hazard. This lint collects in areas where the user cannot observe it. None of the freestanding Electrolux dryers have warnings that the interior of dryer and venting must be cleaned every 18 months to prevent fires in the dryers. UL 2158 requires that cautionary markings be placed on the dryer, which Electrolux failed to do. Electrolux Laundry Centers have a warning label affixed to the dryer drum opening that instructs the user to have the interior of the dryer cleaned approximately every 18 months, while the freestanding dryers do not have this warning on the appliance. While the Installation Guide contains recommendations for the installation of the appliance and the User's Guide makes recommendations for periodic maintenance, it is foreseeable that the user will not follow those recommendations. Even "professional" installations of dryers by the sellers of these appliances are not always done according to the installation instructions, and the end-user may be unaware that the appliance was not installed according to the manufacturer's recommendations. Instruction manuals may be misplaced, or may not be included with the appliance if it is purchased used, such as in a case where the appliances are included as part of a home sale. Electrolux violated basic safety engineering principals by choosing the least preferable method to warn users of the fire hazards, as set forth in the Safety Engineering Hierarchy. As discussed in the section of this report concerning the design defects, a safety device such as a warning lamp could be provided to indicate when professional service is required, and could further include a lockout feature if the warning was ignored.

> Electrolux failed to provide any instructions to potential servicers on how to fulfill their expectations that the interior of the cabinet and the dryer venting will be cleaned during the recommended 18 month cleaning. There are no instruction labels on the appliance. None of the manufacturer's documentation includes this type of instruction. Even the Service Manuals for the ball-hitch dryers are silent on the steps in which a servicer should conduct the 18 month cleanings. The Service Manual describes how to disassemble the dryer for service but does not provide specific instructions on how to determine what parts require preventative maintenance or how to remove lint from areas within the dryer that could create a fire hazard.

Based upon these opinions, it is the Wright Group's conclusion that the design and warnings related to this dryer are unreasonable dangerous and allows for fire ignition to occur. Fuel (lint) and a heat source (electric heating element or gas burner flame) are brought together in the presence of an oxidizer (air). Once these first fuels are ignited, they then spread to secondary fuels (the laundry load, additional accumulations of lint in the lint screen/trap duct assembly and to the numerous combustible plastic components). There is no engineered guard or safety to separate the typical first fuels (lint) from the heat sources. Once a fire occurs, the fire will not be contained due to the unnecessary use of a large quantity of plastics with only no or limited fire resistive properties. The use of combustible internal plastic components in the base of this gas dryer also increases the risk of damage to the gas valve during to the fire, which can increase the intensity of the fire and pose a greater risk of life safety and personal property damaged if it is compromised during the fire. Also, warnings as to the risk of fire are non-existent on the appliance itself as they relate to the hazard associated with the collection of lint behind the drum at the heat source, where it cannot be observed or removed by the user.

Electrolux is responsible for this fire due to its use of a defective design, its failure to re-design the dryer to eliminate the hazard or to design an engineered guard or safety to prevent or reduce the possibility of fire, and its failure to warn the user of the known fire hazards. If Electrolux had followed the basic product safety principles, it would have designed the hazard out of the dryer or guarded against it, instead of solely relying on user instructions to prevent these fire

hazards. As outlined in the hierarchy of safety engineering and product safety principles, user instructions are the least preferable method for addressing product safety hazards. Even if one was to accept Electrolux's expected allegations that the dryer was not properly installed or maintained, Electrolux should have used a safeguard in the form of a cycle counter to force users to have the dryer professionally maintained and lint removed from the heat source, as they expect all users will perform this recurring maintenance every 18 months to remove lint that collects near the heat source. Additionally, Electrolux failed to use proper materials in their Ball-Hitch dryers that added unnecessary fuels within the cabinet and allowed fire to escape containment. They made this decision to use the cheapest plastics with the lowest fire resistance rating instead of metal or even plastics with higher fire resistance rating, even though fire containment testing they performed allowed fire to escape the cabinet.

Based upon the large volume of depositions and discovery documents produced in this case it is clear that Electrolux was aware of the risk of dryer fires caused by the ignition of lint collected in proximity to the heat sources within the dryer prior to when the subject dryer was manufactured. Because Electrolux has no formal internal product safety standards or training, Electrolux's engineers failed to make any attempt to reduce the risk of fire in these Ball-Hitch clothes dryers. In the same respect, even if they had tried to reduce the risk of lint fires through any engineering design, safeguard or through improvements to user warning and instruction, they made no attempt to improve the fire containment properties of the clothes dryers they manufactured. Electrolux was well aware that other manufacturers were voluntarily designing their dryers to contain fires in the early 1990s or before. Electrolux was also privy to years of discussion on future fire containment test requirements forthcoming in the UL 2158 Standard and waited until they were forced to comply before conducting any testing or making any design changes. It is clear that Electrolux was not only negligent in failing to attempt any such engineering improvements, but that they failed to take any action at all.

Any allegations as to the insureds' actions contributing to the fire in respect to improper installation would be unfounded. Most importantly, the dryer came installed in the home when they purchased the property in 2010. The flexible foil transition duct was installed. Mr. Vitale testified that he replaced the exterior vent with a superior model that used more heavy duty

construction than was installed in the home when they purchased it. At the time he replaced the vent hood, the dryer was installed according to building code. Code required an exterior vent with a backdraft damper, which was the type of hood he installed. The vent pipe attached to the hood that passed through the wall was constructed of rigid metal, also in compliance with building code. Lastly, building code allowed the use of a flexible foil transition duct as long as it was 8 feet or less in length and was listed and labeled for this purpose, which the subject transition duct was. The subject duct was actually a GE brand flexible foil clothes dryer transition duct and it is reasonable foreseeable that Mr. Vitale would understand this to be the appropriate duct for his GE clothes dryer. Mr. Vitale testified that the flexible transition duct was installed without any kinks or bends that would restrict airflow.

Any allegations that the clothes dryer was not installed according to Electrolux's Installation Instructions would be unreasonable. The subject dryer, manufactured in 2004, would not have had any on-product warning or instruction labels on the appliance to instruct that a UL listed Clothes Dryer Transition Duct should not be used to connect the dryer to the permanent house venting. However, Electrolux provided this very instruction on a label on the rear of all freestanding dryers manufactured in 2008 and later and on all Laundry Centers manufactured at least from 1996 on. The Vitales were not supplied with a copy of the Installation Instructions that would have given them any further instructions. Had they taken upon themselves to research the Installation Instructions, they would have found that flexible vinyl ducts are prohibited and if they were installing the dryer for the first time, they were recommended to replace foil or vinyl ducts. However, Mr. Vitale was not installing the dryer, only replacing the vent hood. It is also possible that in searching for Installation Instructions they may have found later versions of the Ball-Hitch dryer manuals published after 2008 that clearly allow the use of UL listed Flexible Clothes Dryer Transition Ducts.

Any allegations as to the insureds' actions contributing to the fire in respect to improper maintenance or misuse are also false. Mrs. Vitale testified at her deposition that she maintained the dryer as most users do, cleaning the lint screen between every load. She also testified that she wiped clean the interior and exterior of the dryer on a routine basis. Mr. Vitale testified that he personally cleaned the flexible transition duct approximately one year before the fire, at the

same time he upgraded the exterior vent for the dryer. The Consumer Products Safety Commission's 2010 Consumer Opinion Survey on Clothes Dryer Installation and Maintenance supports that the maintenance conducted by the insured was the same as the maintenance conducted by the majority of users. Although the insured failed to follow the recommendation in the Use & Care Guide to have the interior of the dryer cabinet and venting professionally cleaned every 18 months, there were no signs or symptoms of reduced performance or other reasons that would prompt them to pay a professional to service their dryer. Most importantly, the Vitales never received any manuals for the dryer that was in the home when they purchased the property and were unaware that such an instruction existed. Furthermore, Mrs. Vitale testified that if such an instruction was labeled directly on the dryer in a conspicuous area, she would have followed the instruction to have it cleaned.

It is our opinion to a reasonable degree of scientific certainty that this Electrolux dryer was defective in its design as set forth in this report, and that the defects in the dryer were the substantial cause of the fire. At this point, our examination of the dryer and report on our findings are complete. Should any further information arise that could cause us to amend or change our opinions, we reserve the right to review such information and supplement this report as necessary.

Sincerely,

Ronald Parsons
Fire Analyst

Michael R. Stoddard, Jr.
Fire Analyst

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